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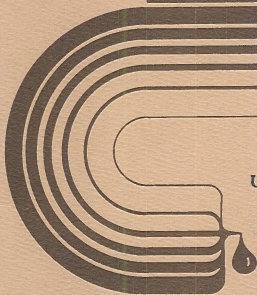
GRAND JUNCTION DISTRICT
OIL SHALE BRANCH



88011461

Environmental Impact Statement Clear Creek Shale Oil Project

OIL SHALE PROJECT
CENTRAL DISTRICT



U.S. Department of the Interior
Bureau of Land Management



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Clear Creek Shale Oil Project

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Prepared by:

Bureau of Land Management
U.S. Department of the Interior

with the assistance of:

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State Director
Colorado State Office

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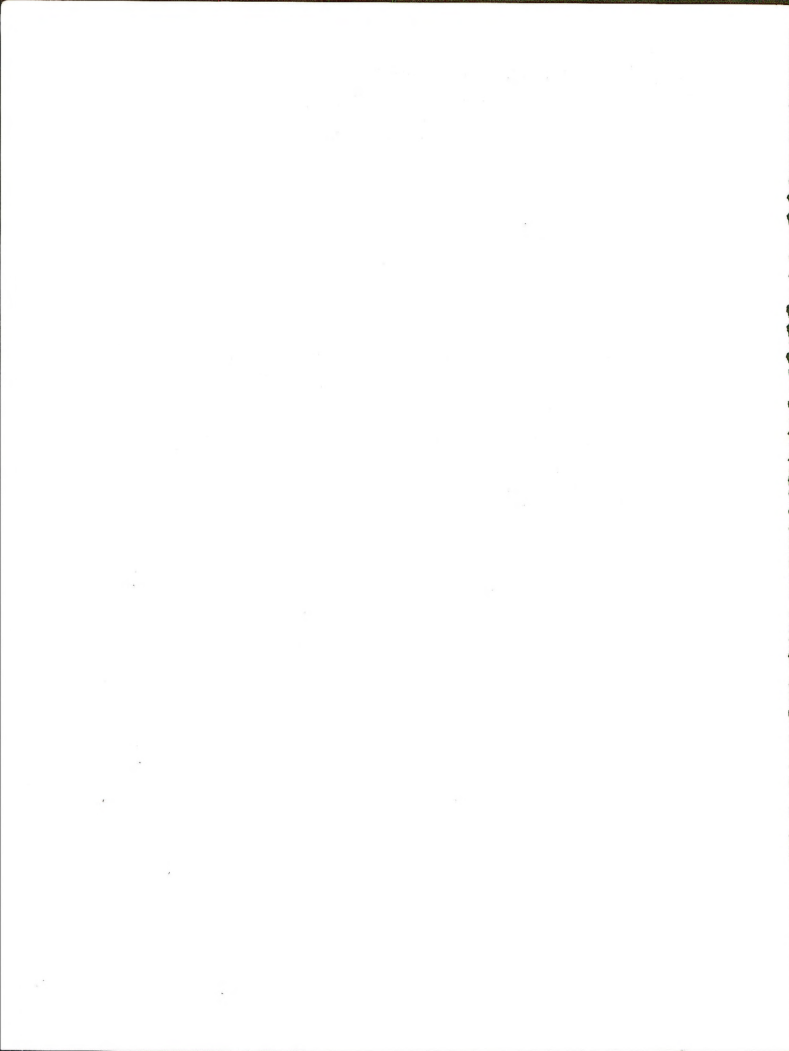
The Final Environmental Impact Statement on the Clear Creek Shale Oil Project has been completed. This FEIS incorporates public and other government agency review comments that were received during the public review period. Reviewer comments were made at public hearings and by letter. These are presented in Chapter 5, along with BLM responses.

The FEIS is not the decision making document. Management decisions cannot be made until a 30 day public review period expires following the filing of the FEIS with the Environmental Protection Agency and distribution to the public. A Record of Decision, documenting the management decisions, will be written and distributed when all supporting analysis and consultation are completed.

Public comments on this FEIS will be accepted for 30 days at the above address.

Thank you for your interest and assistance in this project.

WRIGHT C. SHELDON
District Manager



Clear Creek Shale Oil Project Environmental Impact Statement

() Draft (X) Final

Lead Agency

U.S. Department of the Interior, Bureau of Land Management

Cooperating Agencies

U.S. Army Corps of Engineers
Fish and Wildlife Service
National Park Service
Environmental Protection Agency

Abstract

This EIS assesses the environmental impacts of the Chevron/Conoco proposed Clear Creek Shale Oil Project in the Roan Creek drainage in west-central Colorado. The project includes a combination underground/surface mine; retort and upgrading facilities; a water system; two major storage reservoirs; and support facilities. Alternatives to the Proposed Action consist of three different project configurations with all of the ancillary facilities and No Action. Based on the issues and concerns identified during the scoping process the EIS focuses on the impacts to socioeconomic, water quality, air quality, and cumulative impacts.

EIS Contact

Comments on this EIS should be directed to:

Robert Kline
EIS Team Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, CO 81501

Comments Have Been Requested From:

See Attached List

Date statement made available for U.S. Environmental Protection Agency and the Public:

Draft Statement: 4 March 1983

Final Statement: 30 September 1983

Comments Have Been Requested From:

Federal Agencies

U.S. Department of Agriculture
U.S. Forest Service

U.S. Department of the Army
*Corps of Engineers

U.S. Department of Energy

U.S. Department of the Interior
*Bureau of Reclamation
*Fish and Wildlife Service
Geological Survey
Minerals Management Service
*National Park Service
*Office of Surface Mining
Soil Conservation Service

U.S. Department of Labor
Mine Safety and Health Administration

*U.S. Environmental Protection Agency

State Agencies

Colorado

Governor's Office
*Department of Agriculture
Department of Education
Department of Employment and Training
Office of Energy Conservation
*Department of Health
*Air Pollution Control
*Waste Management
*Water Quality Control
*Department of Highways
*Historic Preservation Office
Department of Local Affairs
*Commerce and Development
Local Government
*Department of Natural Resources
*Geological Survey
Land Commissioners
*Mined Land Reclamation
Mines
*Natural Areas
Parks and Outdoor Recreation
*Soil Conservation Board
*Water Conservation Board

*Water Resources
*Wildlife
Department of Social Services
Public Utilities Commission

Utah

State Clearinghouse

Local Agencies

Cities/Towns

*Grand Junction
Glenwood Springs
*Fruita
Rifle
Palisade
New Castle
Parachute
Silt
De Beque

Counties

*Mesa
*Garfield
Rio Blanco
Delta

Associated Governments of Northwest Colorado

Others

Numerous organizations and individuals expressing interest in the Proposed Action have been sent copies of this document and have been invited to comment.

*Submitted comments on Draft EIS

Clear Creek Shale Oil Project

Final Environmental Impact Statement

Table of Contents

Section	Page
COVER PAGE	ii
EIS REVIEWERS.....	iii
PREFACE.....	x
SUMMARY	xi
2.4.11 BLM's Preferred Alternative.....	2-1
3.7 Aquatic Ecology	3-1
3.7.1 Regional Setting	3-1
3.7.2 Clear Creek Mesa and Associated Siting Activities	3-4
3.7.3 Grand Valley and Associated Siting Activities	3-5
3.7.4 Alternative Siting Activities	3-6
4.2 Air Quality	4-1
4.2.1 General Impacts	4-1
4.2.2 Clear Creek Mesa and Associated Siting Activities	4-1
4.2.3 Grand Valley and Associated Siting Activities	4-7
4.2.4 Alternative Siting Impacts	4-13
4.2.5 Transportation Impacts	4-13
4.2.6 Solid and Hazardous Waste.....	4-13
4.2.7 Secondary Impacts	4-17
4.4 Water Resources	4-19
4.4.1 Surface Water	4-19
4.4.1.1 General Impacts	4-19
4.4.1.2 Clear Creek Mesa and Associated Siting Activities	4-20
4.4.1.3 Grand Valley and Associated Siting Activities	4-29
4.4.1.4 Alternative Siting Activities	4-30
4.4.1.5 Transportation Alternatives	4-31
4.4.1.6 Solid and Hazardous Waste Disposal	4-31
4.4.1.7 Secondary Impacts	4-31
4.4.2 Ground Water	4-31
4.4.2.1 General Impacts	4-31
4.4.2.2 Clear Creek Mesa and Associated Siting Activities	4-32
4.4.2.3 Grand Valley and Associated Siting Activities	4-40
4.4.2.4 Alternative Siting Activities	4-41
4.4.2.5 Transportation Alternatives	4-41
4.4.2.6 Solid and Hazardous Waste Disposal	4-41
4.4.2.7 Secondary Impacts	4-41
4.7 Aquatic Ecology	4-42
4.7.1 General Impacts	4-42
4.7.2 Clear Creek Mesa and Associated Siting Activities	4-42
4.7.3 Grand Valley and Associated Siting Activities	4-52
4.7.4 Alternative Siting Activities	4-53
4.7.5 Transportation Alternatives	4-54

Table of Contents (Continued)

Section	Page
4.7.6 Hazardous Waste Disposal	4-54
4.7.7 Secondary Impacts	4-54
4.8 Terrestrial Ecology	4-55
4.8.1 General Impacts	4-55
4.8.2 Clear Creek Mesa and Associated Siting Activities	4-55
4.8.3 Grand Valley and Associated Siting Activities	4-65
4.8.4 Alternative Siting Activities	4-68
4.8.5 Transportation Alternatives	4-73
4.8.6 Solid and Hazardous Waste Disposal	4-73
4.8.7 Secondary Impacts	4-73
4.14 Cumulative Impacts	4-74
4.14.1 Introduction	4-74
4.14.2 Air Quality and Meteorology	4-74
4.14.3 Noise	4-77
4.14.4 Water Resources	4-78
4.14.5 Topography, Geology, and Paleontology	4-80
4.14.6 Soils	4-81
4.14.7 Aquatic Ecology	4-81
4.14.8 Terrestrial Ecology	4-82
4.14.9 Visual Resources	4-83
4.14.10 Cultural Resources	4-83
4.14.11 Land Use, Recreation, and Wilderness	4-83
4.14.12 Socioeconomics	4-83
4.14.13 Energy and Transportation	4-84
4.18 Mitigation	4-84
4.18.1 Discipline-Specific Mitigation Measures	4-85
4.18.2 Reclamation Potential	4-91
5.0 CONSULTATION AND COORDINATION	5-1
5.1 Introduction	5-1
5.2 Review of the Draft EIS	5-2
5.3 Response to Comments	5-3
5.3.1 EIS Summary/Abstract	5-3
5.3.2 Purpose and Need	5-4
5.3.3 Proposed Action and Alternatives	5-4
5.3.3.1 Description of Proposed Action and Alternatives	5-4
5.3.3.2 Comparison of Alternatives	5-16
5.3.3.3 Agency Preferred Alternative	5-16
5.3.4 Air Quality and Meteorology	5-17
5.3.5 Water Resources	5-34
5.3.5.1 Surface Water	5-34
5.3.5.2 Ground Water	5-45
5.3.6 Topography, Geology, Paleontology	5-48
5.3.7 Soils	5-50
5.3.8 Aquatic Ecology	5-51
5.3.9 Terrestrial Ecology	5-57
5.3.10 Visual Resources	5-66
5.3.11 Cultural Resources	5-66

Table of Contents (Continued)

<u>Section</u>	<u>Page</u>
5.3.12 Land Use, Recreation, and Wilderness	5-67
5.3.13 Socioeconomics	5-69
5.3.14 Energy and Transportation	5-72
5.3.14.1 Energy	5-72
5.3.14.2 Transportation	5-73
5.3.15 Cumulative Impacts	5-74
5.3.16 Mitigation and Reclamation	5-74
5.3.17 Unavoidable Adverse Impacts	5-78
5.3.18 Glossary and References	5-78
5.4 Comment Letters and Hearing Transcripts	5-79
6.0 LIST OF PREPARERS	6-1
7.0 GLOSSARY OF TERMS	7-1
8.0 REFERENCES	8-1

APPENDICES

- B-2 — Air Quality Modeling Methodology and Air Quality Impacts
- C-1 — Summary of Potential Impacts
- C-2 — Socioeconomic Mitigation

List of Figures

<u>Figure</u>	<u>Page</u>
2.3-1 Proposed Action Project Configuration Showing Alternative Siting Activities to the Proposed Action	xii
2.3-2 Clear Creek Alternative Project Configuration Showing Alternative Siting Activities to the Clear Creek Mesa Configuration	xiii
2.3-3 Fruita I Alternative Project Configuration Showing Alternative Siting Activities to the Fruita I Configuration	xiv
2.3-4 Fruita II Alternative Project Configuration Showing Alternative Siting Activities to the Fruita II Configuration	xv
4.4-1 Location of Springs, Alternative Diversion Points, and Dam Sites	4-22
4.4-2 Location of Proposed CCSOP Water Facilities	4-23
4.4-3 Salinity Changes of the Colorado River at the Imperial Dam for the Year 2010 due to the Water Withdrawal by the GCC Joint Venture	4-26
4.4-4 Conceptual Cross-Section Through Pit After Reclamation	4-34
4.14-1 New Projects Assumed for Cumulative Impact Analysis	4-75
5.3-1 Sequence of Disposal and Reclamation of Spent Shale in the Mesa Valley Fill, 1986-2004	5-12
5.3-2 Potential Impacts of Spent Shale Disposal	5-13
5.3-3 Annual Wind Speed and Direction Frequencies for Sites B and C	5-22
5.3-4 Wind Frequency Distribution Plot for Grand Junction, Colorado (1977-1981)	5-23

List of Tables

<u>Table</u>	<u>Page</u>
3.7-1 Regional Characteristics of Streams by Drainage	3-2
3.7-2 Resident Fishes of the Colorado River from De Beque to the Colorado-Utah State Line	3-3
4.2-1 Total Mining Emissions 100,000-bpd Production	4-2
4.2-2 Total Retorting and Upgrading Stack Emissions and Stack Data - 100,000-bpd Production	4-3
4.2-3 Maximum Clear Creek Mesa Air Quality Impacts Summary (PA-100/CC-100)	4-4
4.2-4 Maximum Grand Valley Upgrade Air Quality Impacts (FI-100)	4-8
4.2-5 Maximum Clear Creek Mesa Mine and Retort Air Quality Impacts Summary (FI-100)	4-10
4.2-6 Maximum Grand Valley and Clear Creek Mesa Elemental Deposition Rates in Sensitive Areas (FI-100)	4-12
4.2-7 Total Retorting and Upgrading Emissions and Stack Data 50,000-bpd Production in The Grand Valley	4-14
4.2-8 Maximum Grand Valley Upgrade Air Quality Impacts (FI-100)	4-14
4.2-9 Atmospheric Deposition in PSD Class I Areas and Colorado Category I Areas From the Upgrading and Retorting Facility in Grand Valley	4-16
4.2-10 Maximum Annual Secondary Emission Rates in De Beque (PA-100/CC-100)	4-17
4.2-11 Maximum Annual Secondary Emissions in Grand Junction and Fruita	4-18
4.2-12 Maximum Secondary Grand Valley Air Quality Impacts Summary (FI-100)	4-19
4.4-1 Identified Springs and Seeps Within the Clear Creek Property Boundary that will be Affected by Mining	4-21
4.4-2 Surface Runoff Water Quality from a Chevron Refinery	4-24
4.4-3 Location and Stream Type of Drainage Affected by CCSOP Corridors	4-25
4.4-4 Specifications of On-Site Runoff Storage Reservoirs	4-28
4.4-5 Mine Area/Watershed Disturbance Relationships	4-33
4.4-6 Estimated Drawdown, 200 Feet Away From Selected Production Wells After 5 Years of Continuous Pumping	4-37
4.4-7 Spent Shale Leach Test Results Compared to Bedrock and Alluvial Water Quality	4-40a
4.7-1 Proposed Average Daily Depletion (CFS) for the CCSOP on the Colorado River	4-45
4.7-2 Proposed Total GCC (Chevron, Getty, Cities) Average Daily Depletion (CFS) on the Colorado River Under the CCSOP Proposed Action Alternative	4-46
4.7-3 USFWS Recommended Minimum Flows and Temperature Requirements for the Colorado River	4-49
4.7-4 Percent of Time FWS-Recommended Colorado River Flows Were Not Met During the 1962-1982 Period of Record Resulting From Projected Depletions by the CCSOP and GCC Projects	4-50
4.8-1 Direct Impacts of the Proposed Action on Vegetation and Productivity	4-57
4.8-2 Summary of Estimated Potentially Affected Acreage of Big Game Critical Winter Range for Major Facilities Associated with Project Alternatives	4-59
4.8-3 Relationships of Proposed Action Components with Endangered Plant Species	4-60
4.8-4 Direct Impacts of the Fruita I Alternative on Vegetation and Productivity	4-66
4.8-5 Impacts of Facility Siting Alternatives Upon Vegetation Acreage, Productivity, Revegetation Potential, and Endangered Plant Populations	4-69
4.14-1 Total Emission Assumptions for Modeled Point Sources	4-77
4.14-2 Maximum 24 Hour Predicted Pollutant Concentration Ranges Level Scenario	4-78
4.14-3 Percent Contribution of Direct and Indirect Emissions Related to the Oil Shale Development	4-80

List of Tables (Continued)

<u>Table</u>		<u>Page</u>
4.18-1	Summary of Reclamation Potential	4-91
5-1	List of Commentors on Clear Creek Shale Oil Project Draft EIS	5-4
5.3-1	Generalized Potential Impacts of Spent Shale Disposal	5-15
5.3-2	Minimum Distance Level I Screen Passes	5-25
5.3-3	Chemical Analysis of Combustor Off Gas	5-26
5.3-4	Chemical Analysis of Combusted Shale	5-27
5.3-5	Chemical Analysis of Combusted Shale Fines	5-28
5.3-6	BACT for Mining and Materials Handling	5-29
5.3-7	BACT for the Proposed Retorts	5-29
5.3-8	BACT for the Proposed Upgrading Facility	5-30
5.3-9	Vehicular Emissions Proposed Action	5-30

PREFACE

This Final Environmental Impact Statement (FEIS) on the Clear Creek Shale Oil Project presents the results of the public and agency review comments on the Draft EIS (DEIS) released on March 4, 1983. The procedures regarding responses to comments are outlined in Section 5.3 of the FEIS. All sections of the DEIS were not reprinted in the FEIS, in order to reduce the size and cost of the document (see Table of Contents). Therefore, this FEIS must be used in conjunction with the DEIS.

Minor changes identified during the DEIS review are presented and acknowledged in Chapter 5.0. When the change was not considered critical to the impact analysis, it was not reprinted in the FEIS. These minor changes are documented in the BLM files in Grand Junction, Colorado.

Certain sections of the FEIS have been reproduced because they were substantially changed in response to public comments. These sections were considered to be critical to the overall FEIS impact analysis.

As noted in the FEIS, some of the discipline-specific impacts have been revised due to agency and public comments or updated information. The BLM has reanalyzed the various project alternatives and determined that the agency's preferred alternative remains essentially the same as presented in the DEIS. One minor change in the preferred alternative is the selection of the Upper Dry Fork Reservoir site in Roan Creek, instead of the Lower Dry Fork site.

All documents referenced in the DEIS and FEIS are incorporated by reference into the FEIS, and are available for inspection at the BLM Grand Junction office.

Summary

Proposed Action

Description

Chevron Shale Oil Company and Conoco Shale Oil Inc. propose to develop their upper Clear Creek oil shale property in northwest Colorado to produce 100,000 barrels per day (bpd) of shale oil. The major components of the project would consist of an underground and open pit mine; retorting and upgrading of shale oil; spent shale disposal in upper Clear Creek canyon and in the open pit mine; a GCC Joint Venture storage reservoir in Roan Creek and water diversion facilities on the Colorado River near De Beque; an access road and service corridor along Roan Creek from De Beque to Clear Creek mesa; a water pipeline and service corridor from Fruita to Clear Creek mesa along Big Salt Wash; a water diversion facility on the Colorado River between Fruita and Loma; a reservoir near Garvey Gulch along the Big Salt Wash service corridor; a syncrude pipeline to Parachute Creek; peak employment of 9,000 people; and a railroad spur and rail yard west of De Beque. The reader is directed to Figures 2.3-1 through 2.3-4, for a graphical display of the Proposed Action and the alternatives analyzed in this FEIS.

Analysis and Conclusions

Adverse construction impacts have been identified for all environmental components; the most significant would be impacts to socioeconomic, surface water, recreation, transportation, vegetation, soils, and wildlife.

However, during operation, most impacts would be reduced due to less construction activity, a smaller work force, and initiation of rehabilitation. Impacts on ground water would occur during operations due to increased water withdrawals. Adverse impacts on recreation would occur during construction, but would change to beneficial impacts during the operations phase. Lower adverse impacts on the transportation systems would occur during operations due to the reduction of transportation needs for supplies and the work force. Aquatic ecology would be affected more during operations due to increased water usage. The production of shale oil would be a beneficial impact on the energy balance for the project and also a beneficial use of the resource.

Most socioeconomic impacts are beneficial, particularly in comparison to the No Action Alternative. The Grand Valley area of Mesa County would receive the greatest share of population and economic growth; the Battlement Mesa/Parachute area would also show significant growth. Garfield County would receive larger direct tax benefits. Some municipalities could have difficulty financing public services.

Other Major Alternative Project Configurations Considered

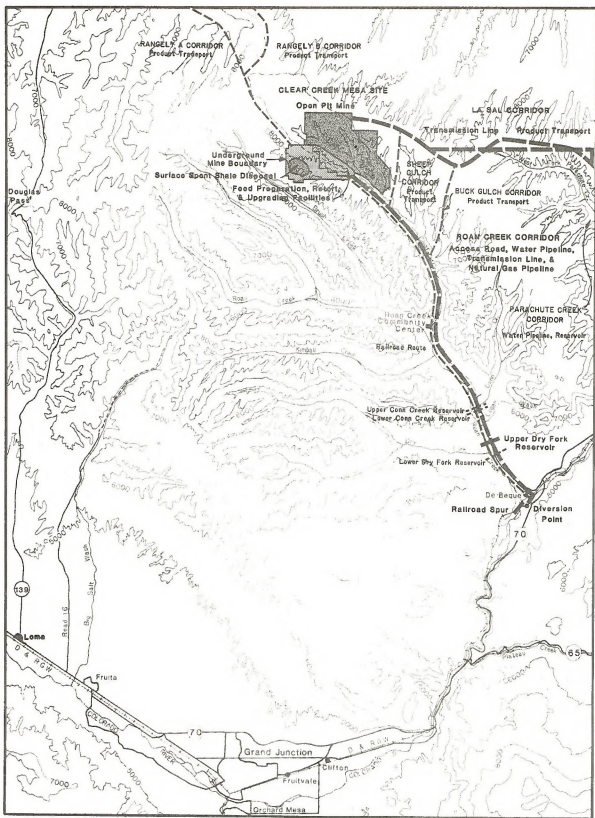
Clear Creek Alternative

Description

This configuration is the same as the Proposed Action with the exception that the Big Salt Wash corridor and reservoir, and the Loma water diversion would not be built.

Analysis and Conclusions

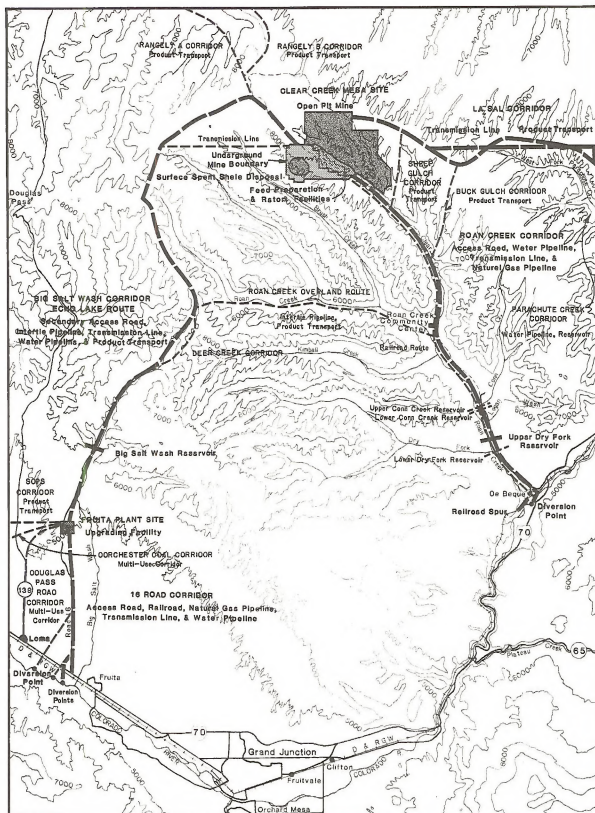
The impacts of this configuration would be essentially the same as for the Proposed Action. Less surface disturbance would occur since the reservoir and service corridor would not be constructed. Therefore, there would be lower impacts on surface water, visual resources, cultural resources, vegetation, soils, wildlife, and the energy balance. The social and economic impacts would be essentially the same as for the Proposed Action.



- Clear Creek Project Configuration
- - - Alternative Siting Activities to the Clear Creek Configuration



Figure 2.3-2 Clear Creek Alternative Project Configuration Showing Alternative Siting Activities to the Clear Creek Mesa Configuration.



— Fruita I Alternative Project Configuration
 - - - Alternative Siting Activities to the Fruita I Configuration

SCALE
 0 1 2 3 4 5
 Miles

Figure 2.3-3 Fruita I Alternative Project Configuration Showing Alternative Siting Activities to the Fruita I Configuration.

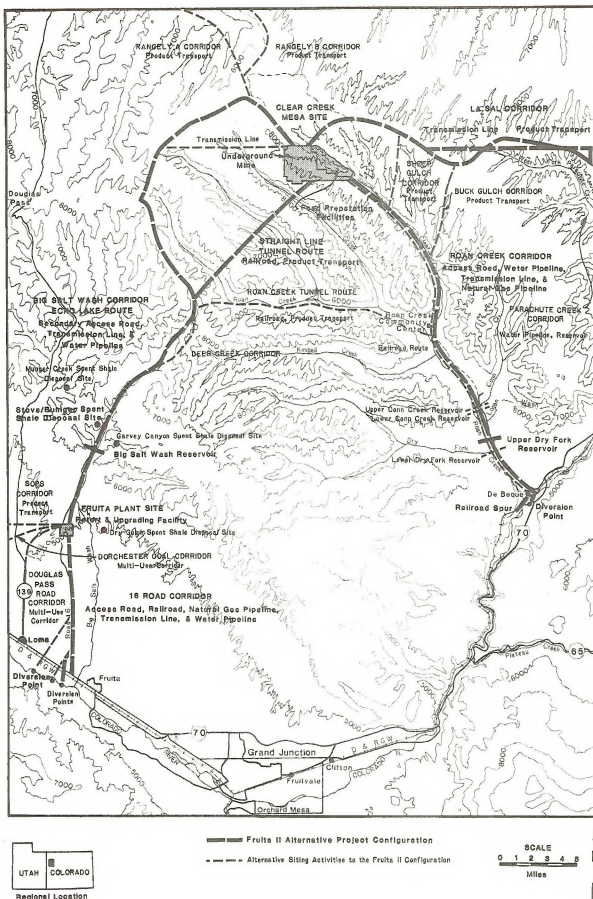


Figure 2.3-4 Fruita II Alternative Project Configuration Showing Alternative Siting Activities to the Fruita II Configuration.

Fruita I Alternative

Description

This configuration is the same as the Proposed Action except that the upgrading facilities would be located north of Fruita and not on Clear Creek mesa. The Big Salt Wash corridor would contain a power transmission line, the Loma water system, and a syncrude pipeline to transport the raw shale oil from the retorts on Clear Creek to the upgrading facilities north of Fruita.

Analysis and Conclusions

The impacts of this configuration would be slightly higher than the Proposed Action on the following environmental components: surface water, land use, visual resources, vegetation, soils, wildlife, and aquatic ecology. The Grand Valley would receive an even greater share of population and economic growth. Mesa County would receive substantial tax benefits from upgrading facilities located there.

50,000-bpd Production Alternatives

Description

All of the major configurations described above have been analyzed at 50,000-bpd as well as the proposed 100,000-bpd production rate. Production at 50,000 bpd would involve mining with underground methods and surface disposal of spent shale. The remaining project components would be as described for the Proposed Action or Fruita I alternatives.

Analysis and Conclusions

In general, the 50,000-bpd alternatives would have fewer impacts due to the smaller facilities, less surface disturbance, and lower air quality emissions. The increase in population would be less than for the Proposed Action. Socioeconomic impacts would be less than their high production counterparts but rapid buildup and decline of the project work force could create more extreme short-term impacts.

Fruita II Alternative

Description

This configuration is the same as the Proposed Action except that both the retorting and upgrading facilities would be located north of Fruita on Operator-owned property. The production rate of this alternative would be 50,000 bpd. Spent shale would be disposed of in the mountainous area north of the upgrading facility.

Analysis and Conclusions

This configuration would result in slightly higher impacts than the Proposed Action on some environmental components. The components that would have lower impacts are air quality, soils, vegetation, recreation, energy, transportation, and topography. Mesa County would receive over three-quarters of the socioeconomic impacts but these impacts would be considerably less than with the Clear Creek or Fruita I configurations. The rapid buildup and decline of the project work force could create more extreme short-term impacts than the Clear Creek or Fruita I configurations.

Other Major Siting Alternatives

Description

These alternatives consist of alternative sites for various support facilities. Siting alternatives analyzed include:

- Eight product transport corridors
- Seven railroad corridors
- Four road corridors
- Two water supply systems
- Three Colorado River diversion points
- Four Roan Creek reservoir sites
- Five spent shale disposal sites
- Two coal transport systems
- Two worker transport systems

Analysis and Conclusions

- Product transport corridors — the La Sal/Parachute Creek route is preferred if a northern market is chosen for shipment of the shale oil. For a southern market the Fruita to SOPS line is preferred. In the event the La Sal and/or the SOPS lines are not constructed, the Rangely B route would be selected.
- Railroad corridor — access to the Fruita site via the Dorchester Coal route and access to Clear Creek mesa via the Roan Creek route (De Beque to Clear Creek mesa).
- Road corridors — access to the Fruita site via the Douglas Pass Road. Access to the Clear Creek mesa site would be via the Roan Creek Road.
- Water diversion points — the Loma intake and the De Beque intake.
- Roan Creek reservoir — the Upper Dry Fork reservoir.
- Spent shale disposal — the Mesa Valley Fill site.
- Coal transport system — a railroad transport system.
- Worker transport system — a bus transport system.
- Powerline corridors — the east-west route.
- A proposed location for the Big Salt Wash Reservoir has been identified by the Operator as a part of the water system. Dorchester Coal Company identified a land use/resource conflict regarding this proposed site in a comment letter on the DEIS (Letter #40; see Section 5.4). Dorchester's comments and the BLM responses can be found in Section 5.3 of this FEIS. No permits or approvals will be issued for this site by the BLM until the apparent land use and resource conflicts can be resolved between Operator and Dorchester Coal Company.

Scoping

Scoping meetings were held in December 1981 in Grand Junction, Rifle, De Beque, and Denver. An agency scoping meeting was also held in Denver in December 1981. This project is being coordinated with the Colorado

Joint Review Process and numerous public meetings have been held since September 1981. The main issues that have been identified (in order of importance) are:

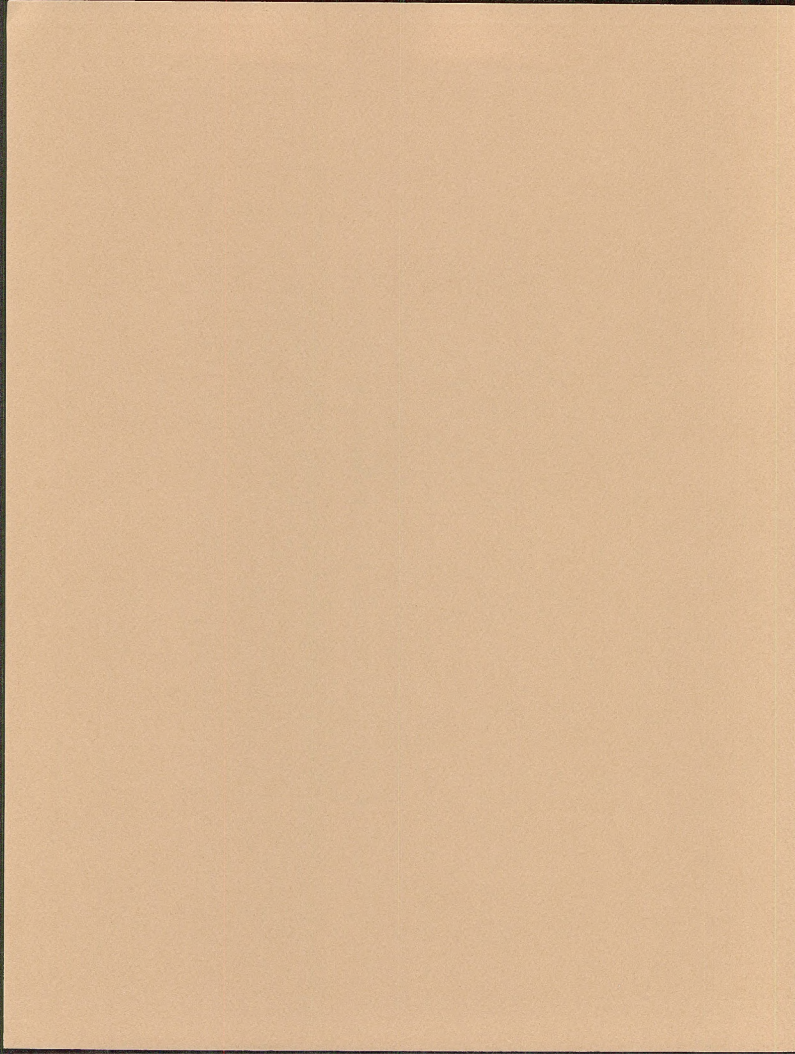
- Socioeconomics
- Surface and Ground Water Quality and Quantity
- Air Quality
- Cumulative Impacts
- Land Use and Recreation
- Development Technology
- Transportation
- Solid Waste Generation and Disposal
- Biological Impacts
- Energy

Projects considered with the CCSOP for cumulative impact analysis were selected according to three criteria: (1) an existing project, (2) a project under construction, or (3) a project that has a commitment of \$100 million or more as of September 1982.



2.0

Proposed Action and Alternatives



2.4.11 BLM's Preferred Alternative

The BLM is required to identify an agency preferred alternative in the FEIS. The agency preferred alternative includes consideration of the agency's mission, national policy, technical issues, physical environment, and the human environment.

For the reasons described in Sections 2.4.1 through 2.4.10 and Chapter 4.0 of the DEIS, the BLM has designated the Fruita I configuration at the 100,000-bpd production rate (FI-100) as the agency preferred alternative.

In the selection of the agency preferred alternative, the Council on Environmental Quality (CEQ) has directed that agencies consider the human environment, which would include the social and economic effects of the action.

Several options exist to select specific alternative configurations of discrete actions as part of the overall proposal. The BLM has selected the following configurations for various project components:

- Product transport corridors — the La Sal/Parachute Creek route is preferred if a northern market is chosen for shipment of the shale oil. For a southern market the Fruita to SOPS line is preferred. In the event the La Sal and/or the SOPS lines are not constructed, the Rangely B route would be selected.
- Railroad corridor — access to the Fruita site via the Dorchester Coal route and access to Clear Creek mesa via the Roan Creek route (De Beque to Clear Creek mesa).
- Road corridors — access to the Fruita site via the Douglas Pass Road. Access to the Clear Creek mesa site would be via the Roan Creek Road.
- Water diversion points — the Loma intake and the De Beque intake.
- Roan Creek reservoir — the Upper Dry Fork reservoir.
- Spent shale disposal — the Mesa Valley Fill site and in-pit disposal.
- Coal transport system — a railroad transport system.
- Worker transport system — a bus transport system.
- Powerline corridors — the east-west route (La Sal).
- A proposed location for the Big Salt Wash Reservoir has been identified by the Operator as a part of the water system. Dorchester Coal Company identified a land use/resource conflict regarding this proposed site in a comment letter on the DEIS (Letter #40; see Section 5.4). Their comments and the BLM responses can be found in Section 5.3 of this FEIS. No permits or approvals will be issued for this site by the BLM until the apparent land use and resource conflicts can be resolved between Operator and Dorchester Coal Company.

A summary of the rationale for the BLM's selection of the preferred alternative is given below. Each scoping issue is addressed.

Production at the 100,000-bpd rate would make a greater contribution to Federal policy and national interest of the United States with regards to energy independence than would production at the 50,000-bpd rate. Further, the higher production rate would be in accordance with the BLM statutory and regulatory responsibility to manage Federal lands to best meet the present and future needs of the American people.

The 50,000-bpd configurations would result in a more rapid increase in population at project startup and a more rapid decline at project completion. The project life at 50,000 bpd would be considerably shorter than at 100,000 bpd.

The preferred alternative would have the most favorable population and fiscal impacts of all project configurations. The location of the taxable project facilities in Mesa County and the ability of Mesa County to absorb the majority of the increased population and supply public services are important considerations. The preferred alternative provides the most favorable balance between population growth and tax base.

The preferred alternative would have essentially the same impacts on surface and ground water as the other 100,000-bpd configurations.

Air quality impacts would be within acceptable limits.

Land use and recreation impacts would be at an acceptable level.

The preferred alternative would have the lowest adverse impacts of all the 100,000-bpd configurations on the transportation system. The impacts would be essentially the same as for the 50,000-bpd configurations.

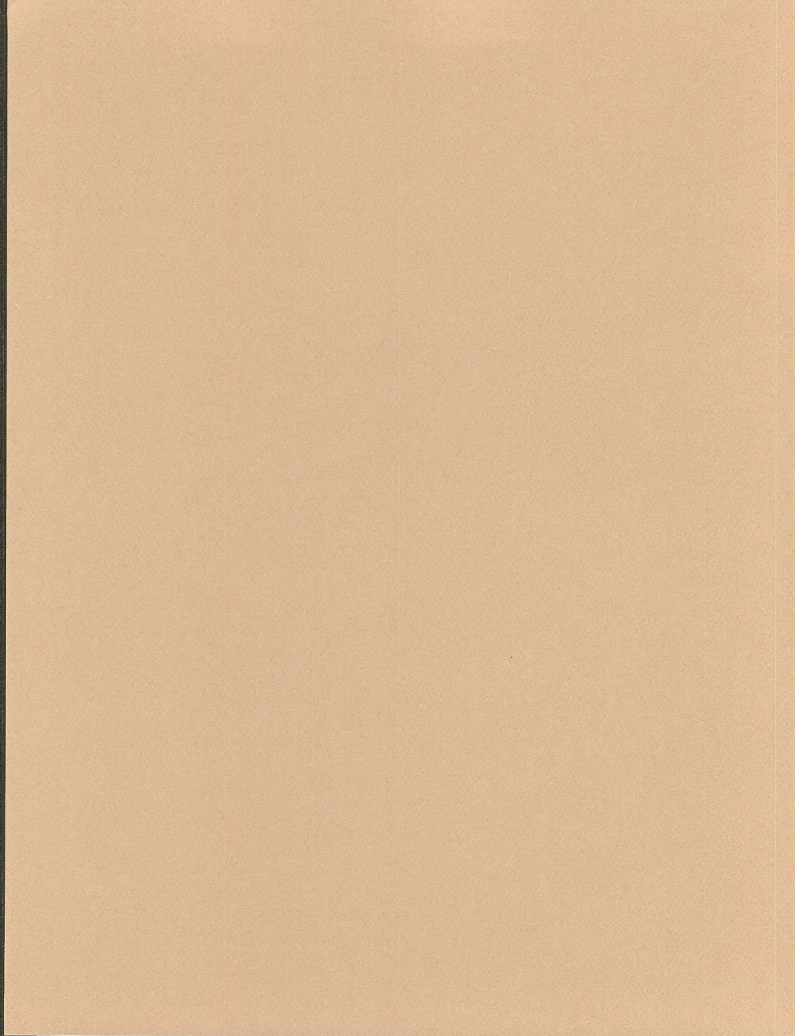
Visual impacts would be slightly higher than for other configurations but would be within acceptable limits.

Impacts on energy consumption and use would be acceptable.

Impacts on all other biological resources would be within acceptable limits.

3.0

Affected Environment



3.7 Aquatic Ecology

3.7.1 Regional Setting

The CCSOP is located in the Upper Colorado River Basin (see Section 3.4.1.1 of the DEIS), primarily in the Colorado River system in the State of Colorado. Streams are the dominant aquatic ecosystem present, although numerous small reservoirs, lakes, and a few larger reservoirs are found in the region. Streams vary in size from small intermittent washes and small perennial streams to the mainstem Colorado River. The lakes and reservoirs vary from small farm ponds to Blue Mesa and Morrow Point reservoirs on the Gunnison River. Trout fisheries exist in the Colorado River and tributaries above De Beque, in the reservoirs and tailwaters of the Gunnison River and in scattered small streams and reservoirs throughout the region. The Colorado River below De Beque supports a low-level channel catfish fishery, as does the lower Gunnison River. Additional warm water fisheries for largemouth bass, crappie, and other species are found in small ponds formed from flooded gravel pits along the Colorado River, and several reservoirs near Loma in the Grand Valley. Characteristics of the aquatic ecosystems in the region which are potentially impacted by project development are presented in Table 3.7-1.

The portion of the Colorado River that will be directly affected lies between DeBeque and Lake Powell, 240 miles downstream. A major tributary, the Gunnison River, enters at Grand Junction, nearly doubling the flow below that point. The Colorado River above Grand Junction is characterized by a cobble substrate, with depths of 3-10 feet and medium range velocities. Below Grand Junction, the river flows through several canyons where velocities increase and deeper holes, some to nearly 60 feet, are found; but the substrate remains rocky. The lower section of the river, especially below Moab, Utah, is characterized by a lower current, sandy bottom and generally shallower depths. The Colorado is joined by the Green River 16 miles above Lake Powell. The resultant larger river flows through Cataract Canyon, a short but very steep, whitewater canyon area with rocky substrate, swift current, and depths to 90 feet.

The ecosystem of the Colorado River involves very little instream plant life, except for algae attached to rocks. The algae is more abundant in the upper, cobble-bottomed portions of the river than in the lower, sandy portion. A considerable amount of plant material is washed into the river from terrestrial sources, especially riparian vegetation along the shorelines. Both the algae and terrestrial debris are fed on by a variety of aquatic organisms, particularly aquatic insects and other invertebrates living at the bottom of the river. These benthic macroinvertebrates are also most common in cobble-bottomed areas, where protection from the scouring action of the current and abundant food can be found. These invertebrates provide a food source for many of the fishes of the river. In the recent past, 26 species of fish have been found in the Colorado River. Only 10 of these are native, the others being introduced in the last 100 years. Table 3.7-2 lists the fishes, along with their present and past status.

Abundance of fishes varies between the upper rocky portions and the lower sandy portions of the Colorado River being considered here. Introduced species, primarily red shiner, sand shiner, carp, and channel catfish, predominate in the sandy portions of the river, whereas native species, primarily flannelmouth sucker, bluehead sucker, roundtail chub, and speckled dace predominate in the rocky portions of the river (Valdez et al. 1982). Other introduced species are sporadic in abundance or common in restrictive habitats such as flooded gravel pits (Table 3.7-2).

This section of the Colorado River has been greatly altered in the last 100 years. Besides the introduction of a variety of fishes, a number of water development projects have dramatically reduced peak flows and increased low flows (Miller et al. 1982a). These factors have probably altered sediment transport mechanisms which have altered habitat for fishes and other aquatic life. Also, gravel pits line the river in the Grand Junction area providing ponded habitats often connected to the river. These gravel pits, along with the extensive changes caused by flow alterations, have benefited the introduced fishes to the detriment of the native species (Miller et al. 1982a).

Three federally-listed endangered species are native to the Colorado River within the area of concern: Colorado squawfish, humpback chub, and bonytail chub. The razorback sucker is listed as endangered only by the State of

Table 3.7-1 REGIONAL CHARACTERIZATION OF STREAMS BY DRAINAGE

Drainage/Stream or Lake	Stream Flow	Stream/Lake Classification ^a	Fishery Potential	Threatened and/or Endangered Fish Present	Potential Number of Fish Species Present
Colorado River (Utah State Line) to DeBeque	Perennial	1-Highest Valued Fishery	high	yes	26
Colorado River (DeBeque to Rifle)	Perennial	2-Highest Priority Fishery	high	yes	20
/Roan Creek	Perennial	3-Moderate Fishery	low-moderate	no	6
/Clear Creek	Perennial	3-Moderate Fishery	low-moderate	no	3
/East Willow Creek	Perennial	Unclassified	low	no	1
/West Willow Creek	Perennial	Unclassified	low	no	1
/No Name Creek	Intermittent	Unclassified	none	no	-
/Mud Springs Creek	Intermittent	Unclassified	none	no	-
/Kimball Creek	Perennial	3-Moderate Fishery	low-moderate	no	2
/Brush Creek	Perennial	3-Moderate Fishery	low-moderate	no	5
/Carr Creek	Perennial	3-Moderate Fishery	moderate-high	yes	3
/Conn Creek	Perennial	4-Limited Fishery	low	no	-
/Dry Fork Creek	Perennial	4-Limited Fishery	low	no	-
/Blanc Canyon Wash	Intermittent	Unclassified	none	no	-
/Parachute Creek	Perennial	3-Moderate Fishery	low	no	-
/West Fork Parachute Creek	Perennial	3-Moderate Fishery	low-moderate	no	-
/East Salt Creek	Perennial	4-Limited Fishery	low	maybe ^d (undocumented)	-
/Corral Canyon	Intermittent	Unclassified	none	no	-
/Barrel Canyon	Intermittent	Unclassified	none	no	-
/Bear Canyon	Intermittent	Unclassified	none	no	-
/Big Salt Wash	Perennial	4-Limited Fishery	low	maybe ^d (undocumented)	d
/Coyote Wash	Intermittent	Unclassified	none	no	-
/Little Salt Wash	Perennial	4-Limited Fishery	low	maybe ^d (undocumented)	d
/Reed Wash	Perennial	Unclassified	low	maybe ^d (undocumented)	6
/Mack Wash	Intermittent	Unclassified	none	no	-
/Grand Valley Canal	Perennial	Unclassified	low	maybe ^c (undocumented)	d
White River (near Rangely)	Perennial	1-Highest Valued Fishery	low	yes	9
/Douglas Creek	Perennial	4-Limited Fishery	low	no	1
/East Douglas Creek	Perennial	3-Moderate Fishery	low-moderate	no	2
/West Douglas Creek	Perennial	4-Limited Fishery	low	no	1
/Cathedral Creek	Perennial	3-Moderate Fishery	low	no	1
/Lake Creek	Perennial	1-Highest Valued Fishery	moderate	yes	3
/Willow Creek	Perennial	-	-	yes ^c	-
/East Fork	Perennial	1-Highest Valued Fishery	moderate	yes ^c	2
/Soldier Creek	Perennial	-	-	yes	-
Mack Mesa Reservoir	Lake	1-Highest Valued Fishery	high	no	8
Highline Lake	Lake	Unclassified	low-moderate	no	9
Ruby Lee Reservoir	Lake	Unclassified	low	no	-
Echo Lake	Lake	Unclassified	low	no	-

Source: Chevron (1981e,f,l,m, 1982a,b); BLM (1983); Carlson et al. (1979); Miller et al. (1982).

^a Based on EPA (1979a) stream classification map of Colorado.^b Based on historical distribution of native species (Behnke and Benson 1980; Joseph 1978).^c Cutthroat trout are reported to occur, but endangered subspecies was not confirmed.^d Fish species found in the Colorado River including endangered species may temporarily frequent the lower reaches of these streams since they connect directly with the Colorado River.

Table 3.7-2 RESIDENT FISHES OF THE COLORADO RIVER FROM DE BEQUE
TO THE COLORADO-UTAH STATE LINE

Common Name	Scientific Name	Endangered Status ^a	Source ^b	Historic Status	Current Status
CATOSTOMIDAE					
White Sucker	<i>Catostomus commersoni</i>	---	I	common	---
Bluehead Sucker	<i>Catostomus discobolus</i>	---	N	common	common
Flannelmouth Sucker	<i>Catostomus latipinnis</i>	---	N*	common	common
Razorback Sucker	<i>Xyrauchen texanus</i>	E-C	N*	rare	common
CENTRARCHIDAE					
Green Sunfish	<i>Lepomis cyanellus</i>	---	I	uncommon	---
Bluegill Sunfish	<i>Lepomis macrochirus</i>	---	I	uncommon	---
Largemouth Bass	<i>Micropterus salmoides</i>	---	I	uncommon	---
Black Crappie	<i>Pomoxis nigromaculatus</i>	---	I	uncommon	---
COTTIDAE					
Mottled Sculpin	<i>Cottus bairdi</i>	---	N	common	common
CYPRINIDAE					
Carp	<i>Cyprinus carpio</i>	---	I	common	---
Humpback Chub	<i>Gila cypha</i>	E-F,C	N*	rare ^c	locally abundant in canyons common
Bonytail Chub	<i>Gila elegans</i>	E-F,C	N*	extinct	common
Roundtail Chub	<i>Gila robusta</i>	---	I	common	---
Red Shiner	<i>Notropis lutrensis</i>	---	I	common	---
Sand Shiner	<i>Notropis stramineus</i>	---	I	common	---
Fathead Minnow	<i>Pimephales promelas</i>	---	I	common	---
Colorado Squawfish	<i>Ptychocheilus lucius</i>	E-F,C	N*	rare	common
Speckled Dace	<i>Rhinichthys osculus</i>	---	N	rare	common
CYPRINODONTIDAE					
Plains Killifish	<i>Fundulus zebrinus</i>	---	I	uncommon	---
ESOCIDAE					
Northern Pike	<i>Esox lucius</i>	---	I	sporadic	---
ICTALURIDAE					
Black Bullhead	<i>Ictalurus melas</i>	---	I	common	---
Channel Catfish	<i>Ictalurus punctatus</i>	---	I	common	---
POECILIDAE					
Mosquito Fish	<i>Gambusia affinis</i>	---	I	uncommon	---
SALMONIDAE					
Brown Trout	<i>Salmo trutta</i>	---	I	sporadic	---

Source: CDOW (1981).

^a E = endangered
C = Colorado list
F = Federal list

^b I = introduced
N = native
* = endemic

^c Locally abundant, but generally restricted to Black Rocks and Westwater Canyons (Miller et al. 1982)

Colorado. All four of these species are large river fish, utilizing the main channel of the Colorado River system and lower portions of larger tributaries.

The Colorado squawfish is found from Lake Powell upstream to near the Government Highline Dam near Palisade, Colorado, which is an effective barrier to upstream fish migration (Valdez et al. 1982). It is probable that its earlier distribution included the river at least to DeBeque and probably upstream to Rifle. Adult Colorado squawfish are found in a variety of habitats. They are found year-round in deeper runs along shorelines, and in large backwaters during runoff (Holden and Wick 1982). Smaller juveniles and young-of-the-year prefer backwater habitat with a silt and sand bottom. Younger squawfish are usually found in the section of the river below Moab; adults are found throughout the river but are more common in the Colorado sections (Valdez et al. 1982). A suspected spawning site was located in 1982 near Clifton, just upstream of Grand Junction

(Miller et al. 1983). Colorado squawfish migrate to spawning sites; migrations of 200 miles have been recorded (Miller et al. 1982a). They spawn in July or early August after river temperatures have reached 20°C. They apparently spawn at clean gravel bars, although actual egg locations have not been verified (Miller et al. 1982a).

Humpback chubs are found sporadically throughout the Colorado River but are concentrated in two canyon areas between Grand Junction and Moab; Black Rocks and Westwater Canyon. These habitats differ from the rest of the river by having areas up to 60 feet deep, apparently a necessary element of good adult humpback chub habitat. Adults and juveniles are found in these canyons, indicating reproducing populations. Adults prefer deep runs and eddies, while young prefer backwaters or other available slack water habitats near the deep, swift runs. Spawning occurred at temperatures of about 16°C during spring runoff in May or June in Black Rocks in 1980 and 1981 (Valdez and Clemmer 1982). Spawning probably occurs over gravel-cobble bars associated with the favored deep canyon habitats. Adults apparently remain fairly stationary in these favored habitats with few movements or migration to other areas. Humpback chub X roundtail chub hybrids were found in DeBeque Canyon and hybrids were also found at Black Rocks and Westwater Canyon (Valdez et al. 1982).

Bonytail chub once occurred throughout the Colorado River below Grand Junction and perhaps upstream as far as DeBeque (Jordan 1891). No recent collections have been made (Valdez and Clemmer 1982) and the species is probably extinct in the Colorado River above Lake Powell.

Razorback suckers are found in the Colorado River from Lake Powell to near Rifle (Valdez et al. 1982; Kidd 1977). Razorbacks are usually collected in flooded gravel pits or in nearby river locations, preferring areas with low velocity and a sand-silt substrate. They spawn in May at river temperatures of 12-16°C. They apparently spawn over gravel bars in the river although ripe adults have also been taken in flooded gravel pits (Wick et al. 1982). No young razorbacks have been found in the Colorado River, indicating poor reproductive success (Valdez et al. 1982). Razorback sucker X flannelmouth sucker hybrids have been collected in the Colorado River since the late 1800's (Jordan 1891; Valdez et al. 1982).

3.7.2 Clear Creek Mesa and Associated Siting Activities

The mine site and associated activities on Clear Creek mesa are located primarily in the Roan Creek drainage. Streams that would be potentially affected include Clear Creek and its tributaries, East and West Forks of Willow Creek; and upper Roan Creek and its tributaries, Carr Creek and Brush Creek. In addition, the West Fork of Parachute Creek, which is a separate drainage, may be affected by the LaSal Corridor, lower Roan Creek and its tributaries. Kimball, Conn, and Dry Fork Creeks will be affected by reservoir construction and water diversion (see Figure 3.4-1). A number of intermittent streams that have no significant aquatic biota may also be affected. Table 3.7-1 lists all of these streams and their fishery potential.

Rainbow trout have been collected in the upper Clear Creek drainage including the East and West forks of Willow Creek. They were only encountered sporadically in lower Clear Creek, where irrigation withdrawal has reduced habitat quality. Mottled sculpin are fairly abundant in the lower section of Clear Creek. Rainbow, hybridized cutthroat, and an occasional brook trout are found in upper Roan Creek and lower portions of its tributaries, Carr and Brush creeks (Woodling 1977; Chevron 1981a). Based on limited observations, Carr Creek appears to receive heavy fishing pressure (Chevron 1981e). Trout populations in the upper Roan Creek system are probably reproducing (Woodling 1977), although stocking occurred in 1975. Populations in the upper Clear Creek system may not be reproducing (Chevron 1981e), but stocking cannot be documented either. In addition to trout, species such as speckled dace, bluehead sucker, and mottled sculpin are found in Roan Creek and its tributaries above the mouth of Clear Creek. Below the mouth of Clear Creek, Roan Creek rapidly degrades as cold-water habitat due to increased temperature, turbidity, and intermittent flows, and trout occurrence is more sporadic (Chevron 1981e; 1982a). For this reason, speckled dace and bluehead suckers are found in decreasing numbers as one moves downstream in lower Roan Creek.

The West Fork of Parachute Creek supports a brown trout population, along with a few rainbows. The habitat is not extensive since the stream is small, but the brown trout population is fairly large (Getty 1983).

Fishery data are not available for the lower portions of Kimball and Dry Fork creeks. Kimball Creek is characterized by poor habitat conditions resulting from high concentrations of dissolved solids (Chevron 1982a) which would limit its value for sport fish. It is also suspected that Dry Fork Creek does not harbor a significant fish population in its lower section. Conn Creek was surveyed in 1982 and no fish were found in the lower portion of the stream (Cities 1983).

Invertebrate populations in these streams are more dense and diverse in the upper, cooler portions where trout and sculpin occur, and become smaller and less diverse in the lower portions of Clear and Roan creeks (Woodling 1977; Chevron 1981e, 1982a). Water quality and fish habitat quality also decreases.

The Colorado River cutthroat trout, *Salmo clarki pleuriticus*, is listed as threatened by the State of Colorado. It was native to the cold-water habitats of the upper Colorado River Basin. It was probably common in the Clear Creek-Roan Creek drainage historically, but has been replaced by introduced rainbow trout and other cutthroat subspecies, both of which have hybridized with the Colorado River cutthroat (Behnke and Benson 1980). The collection of hybridized cutthroat in upper Roan Creek suggests the potential for Colorado cutthroat, but pure or nearly pure populations are doubtful except in the headwaters of Carr Creek where a pure Colorado cutthroat population may exist (Grody 1983).

3.7.3 Grand Valley and Associated Siting Activities

The four lake ecosystems located in the vicinity of the Grand Valley plant site include Mack Mesa Reservoir, Highline Lake, Echo Lake, and Ruby Lee Reservoir. The first two water bodies collectively provide coldwater and warmwater fisheries (Chevron 1982a). Mack Mesa Reservoir is classified as having Class I warmwater fishery potential (EPA 1979a). No viable fishery is believed to exist in Echo Lake (Smith 1982) or Ruby Lee Reservoir. Ruby Lee Reservoir has completely dried up during some years (Chevron 1982a). Gamefish species found in Mack Mesa Reservoir and Highline Lake include rainbow trout, channel catfish, black crappie, walleye, green sunfish, and largemouth bass (Chevron 1982a; CDOW 1982b). The CDOW has reportedly stocked Mack Mesa Reservoir with rainbow trout; Highline Lake has been stocked with rainbow trout, channel catfish, and northern pike (Chevron 1982a). It is doubtful that a trout fishery could exist in these reservoirs without stocking by CDOW. The majority of fish found in these two reservoirs are non-game fish species including red shiner, white sucker, carp, and flannelmouth sucker (Chevron 1982a).

No specific information is available concerning aquatic resources in Big Salt Wash and Little Salt Wash. However, regional studies indicate that these streams are likely to contain populations of warmwater fish species similar to those found in Reed Wash. These species include the flannelmouth sucker, white sucker, carp, green sunfish, roundtail chub, and speckled dace (Chevron 1982a). Other species which may occur during all or part of the year include those fish found in the Colorado River (Table 3.7-1).

The Grand Valley Canal and Government Highline Canal would be crossed by various components of the project. Kidd (1977) sampled some of the drains from these canals and found flannelmouth and bluehead suckers, carp, and fathead minnow to be fairly abundant. The canals probably contain fewer fish (native suckers being most abundant) due to the fairly swift water velocities with no slack water areas of the type preferred by introduced species.

Endangered fishes that may be found in these areas include the three "large river" forms that still occur in the Colorado River. Colorado squawfish and perhaps razorback sucker, are often found in the mouths of irrigation return streams (Kidd 1977) and have also been found in the Grand Valley Irrigation Canal (Smith 1983). Therefore, it is likely they occasionally occur in the mouths of Big Salt Wash and Little Salt Wash, especially during high flows when these areas are backwaters, a preferred habitat. Black Rocks, a major habitat for the humpback chub, is about 20 miles downstream from the mouth of Big Salt Wash.

3.7.4 Alternative Siting Activities

Alternative corridor routes traverse the drainages of several streams tributary to the White River: East Fork Creek, Lake Creek, Willow Creek, Soldier Creek, Cathedral Creek, East Douglas Creek, and Douglas Creek (see Table 3.7-1). The White River has a species composition similar to the Colorado River, including a predominance of native species (flannelmouth and bluehead suckers, roundtail chub, and speckled dace). These species inhabit the upper cobble portions of the White River in Colorado, and introduced species (red shiner, carp) occur in the lower, sandy portions of the river in Utah (Holden and Selby 1979, Lanigan and Berry 1979). East Fork Creek, Lake Creek, Willow Creek, and Soldier Creek contain populations of cutthroat trout, brook trout, and rainbow trout and the streams have been classified by EPA (1979a) as having Class I fishery value.

Parachute Creek may be affected by an alternative water system. Parachute Creek is similar to the Roan Creek system in that headwaters contain reproducing trout populations and lower sections, primarily non-game fishes. The lower sections are dewatered occasionally due to irrigation (BLM 1975). Rainbow trout occur to within about 5 or 6 miles of the Colorado River.

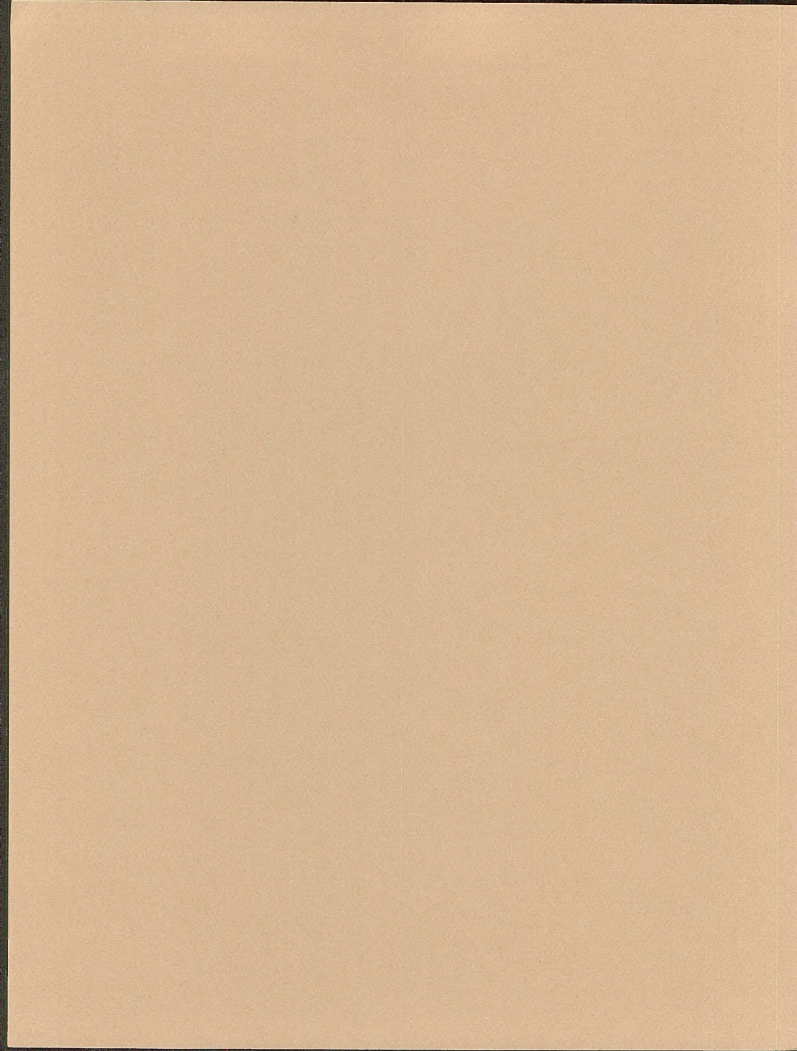
Streams in the upper Roan Creek system, including Brush Creek, Carr Creek and Kimball Creek, may be affected by alternative corridors. These streams were discussed above.

Colorado squawfish have been found in the White River above the mouth of Douglas Creek, although they are more numerous in the lower river near its confluence with the Green River (Wick et al. 1981; Miller et al. 1982b). No spawning of squawfish has been documented in this portion of the White River.

The cutthroat trout of East Fork Creek, Lake Creek, Willow Creek, and Soldier Creek show some hybridization with rainbow trout (Behnke 1977), but the fish are still regarded as relatively pure Colorado River cutthroat trout (BLM 1983b), a Colorado state threatened species.

4.0

Environmental Consequences



4.2 Air Quality and Meteorology

4.2.1 General Impacts

Air quality would be generally impacted by the addition of dust or total suspended particulates (TSP), carbon monoxide (CO), sulfur oxides (SO_x), nitrogen oxides (NO_x), and hydrocarbons (HC) from construction activities, plant operations, and the increased population anticipated from development of the CCSOP.

The ambient concentrations of various pollutants which would result from the proposed facilities would depend upon a variety of factors, including wind speed and direction, temperature lapse rates, local topography, precipitation, emission rates, emission source characteristics, and other complex factors which tend to vary substantially even during brief periods. Computer models were used to simulate environmental conditions and predict ambient concentrations. Descriptions of the models and the assumptions used in defining air quality impacts of the project are presented in Appendix B-2.

Air quality impact studies using three U.S. Environmental Protection Agency (EPA) accepted methods have been completed by the Operator's contractor and are presented in the PSD applications for mining and retorting (Chevron 1982d) and upgrading (Chevron 1982f) facilities. It should be noted that data and analyses provided in the Operator's PSD applications and additional submitted information forms the basis of the following analyses. These models are COMPLEX I (EPA 1980a), PTPLU (EPA 1980b), and ISC (EPA 1979b). Air quality modeling techniques continue to improve. The above three EPA models apply relatively simple Gaussian concepts involving homogeneous and constant flow. These concepts emphasize consistency and objectivity in air quality modeling to obtain conservative estimates of potential impacts. Construction impacts were considered in a qualitative sense and deemed to be of a temporary nature with minor adverse impact. The accuracy of the results of these Gaussian techniques is generally within a factor of two.

Modeling studies predicted the impacts of plant operations upon the air quality above the Clear Creek mesa, in Clear Creek canyon, and in the Grand Valley in the vicinity of the proposed facilities. Because rate of production of emissions resulting from construction and operator activities varied, detailed studies assumed potential emissions. The syncrude product pipeline and powerline corridor were excluded from the analyses since significant air emissions are not expected from these areas.

4.2.2 Clear Creek Mesa and Associated Siting Activities

Proposed Action (PA-100) and Clear Creek Alternative (CC-100)

This section considers the combined air quality impacts due to the Proposed Action with the mine, retorting facility, and upgrading facility located on Clear Creek mesa.

Emissions. The air quality impact analysis of the proposed CCSOP considers stack and fugitive releases of SO₂, TSP, NO_x, CO, and HC in addition to emissions of regulated or potentially hazardous pollutants.

TSP emissions anticipated from mining and shale handling activities include a wide variety of source types. The exact location of sources may move across wide areas in a day-to-day progression. These sources include the pit operation, reclamation activities, and wind erosion of stockpiles and other exposed areas. Other sources, such as haul roads or uncovered conveyors, emit almost continuously along well defined routes. A summary of total TSP, SO₂, NO_x, CO, and HC emissions for the years 2001, 2005, and 2007 associated with mining activity sources is presented in Table 4.2-1. The detailed emissions inventory used in the analysis can be found in Appendix A of the PSD application for the mine and retort facilities (Chevron 1982d).

Table 4.2-1 TOTAL MINING EMISSIONS 100,000-bpd PRODUCTION

Year	TSP	SO ₂	NO _x	CO	HC
2001	1,097	173	1,676	1,095	151
2005	1,133	154	1,874	1,113	151
2007	1,088	155	1,898	863	153

Source: Chevron (1982d).

Three different years, each with different mine configurations and fugitive dust emissions, were modeled to describe TSP impacts from mining activities. Year 2005 was chosen because it is the year with maximum potential fugitive dust emissions. Year 2001 was modeled because of maximum near-surface emissions and year 2007 was modeled because it is the first year of maximum production.

The emissions rates and stack height information associated with the retorting facilities are presented in Table 4.2-2. Sources with identical stack parameters in the same vicinity were grouped to form composite sources with the combined emissions of the individual stacks. These composite sources were assigned geographical coordinates corresponding to the geometric mid-point of the individual sources in each source group. Constant year-round emissions corresponding to retorting for a 100,000-bpd oil shale facility were assumed for the modeling analyses. Emissions calculations for the point sources associated with the retorting facility can be found in Appendix A of the mine and retort PSD application (Chevron 1982d).

The emission rates and stack exhaust information for the upgrading facility is also presented in Table 4.2-2. The fugitive dust sources associated with coal, limestone, and ash handling for the steam generators amount to less than 1 percent of the total TSP emissions (0.16 ton/year) associated with the upgrading, and therefore were not modeled in the air quality impact analysis. Detailed emission calculations are contained in Appendix 2 of the upgrading PSD application (Chevron 1982f).

The emission source modeling configuration was derived from the plot plans of the proposed upgrading facility (Chevron 1982f). For modeling, similar multiple source emissions from a single-stack are assumed to be located at the mean coordinate of the similar stacks.

Air Quality. This section describes the the ISC modeling results of the mining and ore handling operation, as well as the COMPLEX I results for retorting and upgrading emissions on the mesa. Table 4.2-3 lists the predicted maximum air quality impacts of the plateau-top retorting, upgrading, and mining stack and fugitive emissions for the Proposed Action. Listed for each appropriate pollutant averaging time and receptor location are the predicted maximum concentrations in the PSD Class II areas and in the Class I Flat Tops Wilderness Area. Monitored background concentrations are provided in addition to the total concentrations for comparison to the limiting NAAQS.

Since predicted maximum mining impacts would occur at different receptor locations than those for the retorting and upgrading facilities, the maximum predicted values for all three processes are not additive. Therefore, the analysis of TSP impacts from the mine has been performed and presented in Table 4.2-3 separately from those associated with upgrading and retorting. A combined analysis of all three facilities was not performed because significant exceedence of PSD Class II increments and the NO₂ National Ambient Air Quality Standards (NAAQS) were predicted for the retorting and upgrading facilities. It was deemed that this particular facility arrangement was significantly adverse without combined impacts. Combined impacts would exacerbate the impact. Impacts to other Class I and Colorado Category I areas were not analyzed because of the significant exceedences of PSD Class II increment and the NO₂ NAAQS predicted in the immediate area.

Table 4.2-2 TOTAL RETORTING AND UPGRADING STACK EMISSIONS AND STACK DATA - 100,000-bpd PRODUCTION^a

Facility	Stack ^b Height	No. of Stacks	SO ₂		TSP		NO _x		CO		HC ^c	
			(g/sec)	(ton/yr)	(g/sec)	(ton/yr)	(g/sec)	(ton/yr)	(g/sec)	(ton/yr)	(g/sec)	(ton/yr)
Retorting Emissions												
Coal Grinding	Low	11	1	19	1	38	2	61	1	19		
Steam Superheaters	Mid	11	7	233	2	57	22	753	7	233		
Retort Combustor	Upper	11	94	3,250	119	4,122	1,008	35,026	2,044	71,046		
TEG Concentrator	Mid	5	0	1	0	1	0	2	0	1		
Upgrading Emissions												
Reactor Feed	Mid	8	1	35	0	9	3	113	1	35		
Reactor Charge	Mid	8	1	35	0	9	3	113	1	35		
Fract Tower Reboiler	Mid	4	3	88	1	22	8	281	3	88		
Reformer Furnaces	Mid	8	11	402	11	372	70	2,402	11	402		
Naphtha Vaporizers	Mid	4	1	18	0	4	2	113	1	18		
Feed Gas Preheat	Mid	4	0	14	0	4	1	46	0	14		
BSRU Tail Gas	Mid	4	1	49	0	0	0	0	1	49		
Steam Generator	Upper	4	26	904	4	143	96	337	26	904		
TOTAL EMISSIONS			146	5,048	18	4,781	1,215	42,238	2,095	72,844	369	12,837

Source: Chevron (1982f).

^a Minor and start-up sources not included in air quality impact analysis

^b Low = "lower-level emissions" (0-25 m)

Mid = "mid-level emissions" (25-45 m)

Upper = "upper-level emissions" (45-100 m)

^c A breakdown of hydrocarbon emissions is not available.

Table 4.2-3 MAXIMUM CLEAR CREEK MESA AIR QUALITY IMPACTS SUMMARY (PA-100/CC-100)

Pollutant	Averaging Time	Background ^a Conc. ($\mu\text{g}/\text{m}^3$)	Predicted PSD Class I		Predicted PSD Class II		Total Conc. ($\mu\text{g}/\text{m}^3$)	Standards		
			Impacts Receptor Location	Increment Conc. ($\mu\text{g}/\text{m}^3$)	Impacts Receptor Location	Conc. ($\mu\text{g}/\text{m}^3$)		Class I Increment ($\mu\text{g}/\text{m}^3$)	Class II Increment ($\mu\text{g}/\text{m}^3$)	Limiting NAAQS ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	1	Flat Tops W. Boundary	<1	4-km NNE of Retorts	20	21	2	20	80
	24-Hour	14	Flat Tops W. Boundary	2	4-km NNE of Retorts	110	124	5	91	365
	3-Hour	17	Flat Tops W. Boundary	11	7-km NNW of Retorts	324	341	25	512	1,300
TSP ^b	Annual	15	Flat Tops W. Boundary	<1	6-km NNE of Retorts	12	27	5	19	60
	24-Hour	89	Flat Tops W. Boundary	2	6-km NNE of Retorts	61 ^c	150 ^d	10	37	150
TSP ^e	Annual	15	Flat Tops W. Boundary	<1	1-km S. of Mine	4	19	5	19	60
	24-Hour	89	Flat Tops W. Boundary	<1	1-km S. of Mine	31	120	10	37	150
NO ₂ ^f	Annual	4	Flat Tops W. Boundary	--	6-km NNE of Retorts	113 ^d	117 ^d	--	--	100
CO	8-Hour	2,500	Flat Tops W. Boundary	--	16-km WSW of Retorts	971	3,471	--	--	10,000
	1-Hour	3,000	Flat Tops W. Boundary	--	11-km NW of Retorts	4,075	7,075	--	--	40,000

Source: Chevron (1982d, 1982y).

^a Background concentrations representative of facility area. The actual background concentration in other impact areas may be lower.^b Modeled from the retort and upgrading emission.^c Equal to or exceeds PSD increment.^d Equal to or exceeds limiting NAAQS.^e Modeled from total mining emissions.^f Modeled as total NO_x.

For the Proposed Action, PSD Class II annual and 24-hour SO_2 and the 24-hour TSP increments may be consumed or exceeded. The SO_2 concentrations in the Flat Tops Wilderness Area were found to be most constraining for Class I areas, consuming nearly 50 percent of the Class I increments.

Additionally, when the retorting and upgrading impacts were added to the background concentrations, 24-hour particulate and annual NO_2 values (modeled as NO_x) were predicted to equal or exceed the federal annual ambient air quality standard. TSP 24-hour values were predicted to be 61 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Combined with background levels, this represents 73 percent of the applicable NAAQS.

Since fugitive dust emissions associated with mining occur primarily near the source, ambient TSP concentrations decrease rapidly with distance. The highest 24-hour particulate concentration due to mining and ore handling is $31 \mu\text{g}/\text{m}^3$, occurring on the southern property boundary at the receptor. The highest predicted annual mean from mining and ore handling is $4 \mu\text{g}/\text{m}^3$ and occurs at the southern property boundary. The maximum predicted 24-hour TSP concentration from mining consumes 84 percent of the PSD Class II increment; the maximum annual geometric mean of $4 \mu\text{g}/\text{m}^3$ consumes 22 percent of the PSD annual geometric mean increment.

Transport of significant quantities of pollutants from Clear Creek mesa to Colorado National Monument or Dinosaur National Monument would not be likely given the distance to the monuments (over 63-kilometers and 92-kilometers, respectively), and the low probability of meteorological conditions to effectively transport pollutants to these areas. Infrequent, stable, light northerly and easterly winds occur less than 1 percent each and do not persist long enough to effectively transport the pollutants to either monument (Chevron 1983b).

An analysis of the ozone impacts from the Proposed Action has been conducted (Chevron 1982q) using the EPA (1980c) Empirical Kinetics Modeling Approach (EPA/EKMA) and ERT/EKMA (Chevron 1982q). A further discussion of the ERT/EKMA Model can be found in Appendix B-2. Results of the analysis indicate that emission of hydrocarbons and oxides of nitrogen from oil shale facilities will have a minimal impact on ambient ozone concentrations, with a range of predicted ozone concentrations for all scenarios from 0.010 to 0.078 ppm.

Visibility. As a first step, a Level-1 visibility screening analysis (Latimer and Ireson 1980) was performed to determine whether any significant impacts would be possible at the nearby Flat Tops Wilderness Class I area. The Level-1 visibility screening analysis is a simple, straightforward calculation designed to identify those emission sources that have little potential of adversely affecting visibility. If a source passes this screening test, it would not be likely to cause significant visibility impairment, and further analysis of potential visibility impairment would not be necessary. This analysis indicated that significant impacts cannot be ruled out at 82 kilometers (the distance to the Class I area); and, moreover, that the Level-1 analysis would not be passed until a distance of 149 kilometers when considering the retort and upgrade emissions on the mesa. Thus, a more detailed visibility analysis was required to predict potential visibility impacts. Due to the degree of failure of the Level-1 test, it was likely that a Level-2 analysis would also fail. Therefore, the PLUVUE visibility model was applied using representative worst-case meteorological scenarios (see Section 5.3.3.4 of the FEIS for additional discussions on this subject).

The worst-case meteorology was based on methods presented in Latimer and Ireson (1980). The lines of sight of concern were determined in conjunction with the U.S. Forest Service, and were the views of Shingle Peak as observed from Big Marvine Peak and Blair Lake. The plume trajectories from the source to either of the lines of sight were calculated.

After all trajectories were calculated using hourly meteorological data collected at the mesa, the data were sorted by considering the persistence of the worst-case meteorological conditions, the time of day of plume arrival (after sunrise and before sunset), and the time of year in terms of likely visitor use of the Class I area. Four cases were identified and analyzed after this trajectory calculation.

The visibility impacts predicted by the modeled plume were found to be significant for both lines of sight under two cases. Although no explicit guidelines are presently available regarding the significance thresholds of these

visibility indices, the values suggested in Latimer and Ireson (1980) may be used to interpret the results. Their thresholds indicate significant impacts in contrast/discoloration and plume perceptibility.

Atmospheric Deposition. Acid deposition is considered as an Air Quality Related Value (AQRV) for federally designated Class I areas which are within close proximity of a facility. Acid deposition is a regional phenomenon generally associated with emissions generated by large cities and major industrial sources. Even so, it has been documented in a high-altitude Rocky Mountain setting where no direct connection has been made to major emissions sources (Lewis and Grant 1980). Additional studies and analyses have been done by Lewis and Grant of CSU, Turk of U.S. Geological Survey (1982), and Fox of the U.S. Forest Service (1981). Most of these studies of western acid deposition indicate it is unlikely, but still unknown whether significant contributions are from an individual source alone.

Potential deposition of sulfur and nitrogen in the Flat Tops Wilderness was modeled using the deposition velocity approach presented in the Air Quality Technical Report for the Supplemental EIS for the Prototype Oil Shale Leasing Program (Dietrich et al. 1982). Deposition in the Flat Tops Wilderness Area from the retorting and upgrading facilities located on Clear Creek mesa was estimated from the predicted maximum 24-hour SO_2 and NO_x concentrations. This analysis assumes the following.

- The estimated worst-case single concentration is representative of deposition to the entire wilderness area.
- All sulfur compounds were assumed to be SO_2 and nitrogen compounds were assumed to be NO_x .
- Dry deposition velocity of NO_x and SO_2 was assumed to be 1 centimeter per second (cm/sec).
- Annual average deposition rates for nitrogen are estimated assuming a ratio of 5:1 from the 24-hour scaled estimate.
- Complete mixing in the lakes of snowmelt or runoff.

For the proposed action, the 24-hour and annual dry sulfur deposition rates are estimated to be 10.3 gram/hectare/day and 0.2 kilogram/hectare/year respectively. The 24-hour and annual nitrogen dry deposition rates are estimated to be 7.8 gram/hectare/day and 0.6 kilogram/hectare/year.

Wet deposition rates were estimated from precipitation statistics for the Flat Tops Wilderness Area. Assuming an annual average mixing depth of 2,600 meters (Holzworth 1972) and the complete removal during the 1-hour precipitation event on each of the event days (Department of Commerce 1968), the effective annual-average wet deposition velocity of 0.8 cm/sec can be calculated. Applying these values to the concentrations of SO_2 and NO_x in the wilderness area results in conservative wet deposition rates of 80 percent of the dry deposition rates.

In the Flat Tops Wilderness Area, total sulfur and nitrogen deposition is conservatively estimated to be as high as 0.4 and 1 kilogram/hectare/year, respectively. Turk and Adams (1982) have measured the buffering capacity of a number of lakes, and have identified three, Oyster, Upper Island, and Ned Wilson, with alkalinities of 200, 100, and 70 microequivalents per liter ($\mu\text{e}/\text{l}$), respectively. The estimated deposition rates are not expected to alter the pH of Oyster and Upper Island lakes but may slightly lower the level of Ned Wilson lake below the current pH value of 6.76. It is not currently known what effect, if any, these shifts would have on the biota of the Flat Tops. In general, as aquatic systems acidify, the physiological stress is likely to progressively alter biological population structures. At the acidification levels reported (pH of 7-6), elimination of certain phyto- and zooplankton species is possible (reducing diversity), but a significant change in total biomass is unlikely.

Production Rate Alternatives (PA-50, CC-50)

Preliminary information suggests that reducing production by 50 percent would reduce all applicable air quality impacts by a proportional amount. However, specific changes in facility configuration may vary this

relationship. Fugitive dust impacts from mining and ore handling activities would be further reduced because a 50,000-bpd facility would utilize underground mining with less material handling. Locations of maximum concentrations for all facilities could also be different than those for a 100,000-bpd facility. An EPA Level-I visibility analysis was undertaken to determine potential visibility impacts for a 50,000-bpd facility on Dinosaur and Colorado National Monuments. EPA's VALLEY model was run for these two areas to predict the SO₂ and TSP impacts (Chevron 1982y).

TSP and SO₂ impacts are predicted to be negligible at Colorado National Monument and less than 30 percent of Colorado Category I SO₂ increments at Dinosaur National Monument. Further analyses would be needed to compute impacts to Class II areas and to the Flat Tops, but nevertheless, the impacts would be less than those predicted for full production. Although only very small SO₂ or TSP impacts are predicted, potential visibility effects cannot be ruled out for this configuration. Regional haze should not be a problem, but "Level-I results indicate that plume blight might merit further study, if one of these (50,000 bpd) alternatives were pursued" (Chevron 1982y).

4.2.3 Grand Valley and Associated Siting Activities

Fruita I Alternative (FI-100)

This section considers the air quality impacts of the retorting and mining facilities on Clear Creek mesa and the upgrading facility in Grand Valley. Because of the limited interaction between the upgrading and retort and mining facilities, the analysis is separated into two parts discussing the impacts on Grand Valley, and impacts on Clear Creek mesa.

Emissions. Basic emission assumptions other than location of sources are the same as described in Section 4.2.2. Emissions rates for the mining and ore handling activity, retort facility, and upgrade facility are presented in Tables 4.2-1 and 4.2-2.

Air Quality. This section describes the results of the COMPLEX I modeling of the operational phase of the upgrading facility in Grand Valley, the updated modeling of the current engineering configuration of the retorting facility, and the ISC modeling of the mining and ore handling facility. Table 4.2-4 lists the predicted air quality impacts in the vicinity of the proposed upgrading facility using meteorological data for 1977 through 1981. All of the predicted maximum annual average short-term impacts are in compliance with the PSD Class II increments. Short-term impacts of SO₂ and TSP were found to be the most constraining, each consuming more than 80 percent of the respective Class II increments. These impacts occurred during low wind speed and stable plume transport to high terrain areas adjacent to the upgrading site. A detailed listing of the meteorological conditions associated with the worst-case, short-term impacts are reported in Chevron (1982f).

When the upgrading impacts were added to representative background pollutant concentrations, predicted impacts were well below all applicable NAAQS standards.

Impacts from the upgrading facility predicted to occur at Arches National Monument (Table 4.2-4), again using COMPLEX I under light wind speeds and moderately stable conditions, are well below the Class I PSD increments. Annual average impacts were not specifically modeled but will be less than the maximum 24-hour average.

Impacts from the upgrading facility at other Class I PSD areas, such as West Elk Wilderness and Black Canyon of the Gunnison National Monument, were estimated using COMPLEX I and worst-case meteorological conditions. Modeling results in Table 4.2-4 show all concentrations less than or equal to 1 µg/m³ for SO₂ and TSP. No significant impact is expected to occur in the Flat Tops Wilderness due to its distance (over 150 kilometers).

Specific air quality impact analyses were also performed for Colorado National Monument, a Colorado Category I area (Table 4.2-4). All state increments are met, except the 3-hour average consuming all of the SO₂

Table 4.2-4 MAXIMUM GRAND VALLEY UPGRADE AIR QUALITY IMPACTS (FI-100)

PSD Class I Predicted Impacts								
Pol.	Avg. Time	Back ^a Conc. (µg/m ³)	Receptor Location	Inc. Conc. (µg/m ³)	Receptor Location	Inc. Conc. (µg/m ³)	Receptor Location	Inc. Conc. (µg/m ³)
SO ₂	Annual	3	ARCH ^b E Boun	1	BACA W Boun	1	WELK W Boun	1
	24-Hour	24	ARCH ^b E Boun	1	BACA W Boun	1	WELK W Boun	1
	3-Hour	39	ARCH ^b E Boun	2	BACA W Boun	1	WELK W Boun	1
TSP	Annual	33	ARCH ^b E Boun	1	BACA W Boun	1	WELK W Boun	1
	24-Hour	59	ARCH ^b E Boun	1	BACA W Boun	1	WELK W Boun	1
NO _x ^d	Annual	2						
CO	8-Hour	1,040						
	1-Hour	2,680						

PSD Class II Predicted Impacts		Colorado Cat. I Predicted Impacts		Mesa County TSP Non-Attainment		Standards			
Receptor Location	Conc. (µg/m ³)	Receptor Location	Conc. (µg/m ³)	Rcp Loc.	Conc. (µg/m ³)	Class II Total Conc. (µg/m ³)	Class I ^c Inc. (µg/m ³)	Class II Inc. (µg/m ³)	Limit, NAAQS (µg/m ³)
1.8-km N of Upgrade	5	COLM Boun	1			8	2	20	80
0.2-km S of Upgrade	79	COLM Boun	6			103	5	91	365
0.2-km S of Upgrade	420	COLM Boun	24			459	25	512	1,300
1.8-km N of Upgrade	2			NA ^e	1	35	5	19	60
0.2-km S of Upgrade	31				3	90	10	37	150
1.8-km N of Upgrade	21					23	--	--	100
0.2-km S of Upgrade	242					1,282	--	--	10,000
0.2-km S of Upgrade	389					3,609	--	--	40,000

Source: Chevron (1982f,z)

^a Background concentrations representative of facility area. The actual background concentration in other impact areas may be lower.^b Four letter acronyms have been used to designate national parks and wilderness areas: ARCH = Arches National Monument, BACA = the Black Canyon of the Gunnison National Monument, WELK = the West Elk Wilderness, and COLM = the Colorado National Monument.^c Colorado Category I Increments are the same as PSD Class I increments for SO_2 only.^d Modeled as total NO_x .^e Non-Attainment Boundary line at the Book Cliffs.

which is $6 \mu\text{g}/\text{m}^3$ under worst case conditions. The highest, second highest 24-hr SO_2 concentration predicted at the monument boundary is $2 \mu\text{g}/\text{m}^3$ and was used for determining the impacts at Colorado National Monument. It is expected that TSP values would be less or equal to the Mesa County non-attainment area values shown on Table 4.2-4, since the Colorado National Monument is at a greater distance. Dinosaur National Monument, which is also a Category I area, is over 44 kilometers from the Fruita facility and should not be significantly affected.

Particulate concentration levels in the Mesa County TSP nonattainment area were predicted (using COMPLEX I) to be below the EPA significance levels, as shown in Table 4.2-4. Maximum annual average impacts at the nonattainment area were less than $1 \mu\text{g}/\text{m}^3$. Maximum 24-hour impacts were 60 percent of the significance level.

An analysis of the ozone impacts from the Grand Valley upgrade facility has also been conducted and is discussed in the PSD application (Chevron 1982f). The projected ozone impacts were calculated using EPA's (1980c) Empirical Kinetics Modeling Approach (EPA/EKMA) and ERT/EKMA models (Chevron 1982f). A further discussion of ERT/EKMA can be found in Appendix B. Results of the ozone impact analysis indicate that emissions of hydrocarbons and oxides of nitrogen from oil shale upgrade facilities will have a minimal impact on ambient maximum ozone concentrations, with a range of predicted ozone concentrations for all the scenarios from 0.019 to 0.055 ppm for the ERT/EKMA and EPA/EKMA simulations. Emissions from the mine and retort facilities were not included because the EKMA model cannot treat multiple direction transport and is therefore beyond current scientific techniques.

Impacts from the Clear Creek mesa mining and retorting facility, presented in Table 4.2-5, show no predicted exceedences of federal ambient air quality standards or PSD Class II increments. The most adverse impacts would be 24-hour average TSP, which consumes 75 percent of the PSD Class II increment and the annual average NO_2 concentration, which is predicted to be 46 percent of the federal ambient air quality standard. A full discussion of the modeling results can be found in Chevron (1982d). Impacts from the mesa retorting facility in the Flat Tops Wilderness Area are also shown in Table 4.2-5. Short-term SO_2 concentrations consume 30 percent of the Class I PSD increment and 24-hour TSP concentrations consume 20 percent of the PSD increment.

Transport of retorting emissions on the mesa to Colorado National Monument and Dinosaur National Monument are not likely, due to the great distances and unlikely occurrence of appropriate meteorological conditions.

Table 4.2-5 presents the predicted maximum cumulative particulate impacts from both the mining and retorting facilities on the mesa. The maximum 24-hour cumulative impact is $32 \mu\text{g}/\text{m}^3$, predicted along the northern property boundary. Retorting emissions contributed 89 percent of the anticipated impact at this location. The second predicted maximum TSP concentration of $31 \mu\text{g}/\text{m}^3$ occurs at the same location under different meteorological conditions. The mining and ore handling activities account for 99 percent of this impact. The maximum predicted annual average cumulative impact is $7 \mu\text{g}/\text{m}^3$ or about 37 percent of the annual average PSD Class II increment.

When the nocturnal drainage pattern is strong and well developed, plumes originating on the mesa can be entrained into the canyon. A box model approach was used in the Chevron analysis (1982d) to simulate SO_2 and TSP concentration in the canyon. The worst-case, predicted 24-hour average particulate and SO_2 concentrations are 24 and $7 \mu\text{g}/\text{m}^3$, respectively, which are 65 and 3 percent of the Class II PSD increments. These concentrations are predicted 8 kilometers down the canyon at the closest point off the CCSOP property.

An analysis of the ozone impacts from the FI-100 retort facility has also been conducted (Chevron 1982a). The projected ozone impacts were calculated using EPA's (1980c) Empirical Kinetics Modeling Approach (EPA/EKMA) and ERT/EKMA models (Chevron 1982d). Results of the ozone impact analysis indicate that emissions of hydrocarbons and oxides of nitrogen from oil shale retort facilities will have a minimal impact on ambient maximum ozone concentrations, with a range in predicted ozone concentrations for all the scenarios from 0.029 to 0.078 ppm for the simulations.

Table 4.2-5 MAXIMUM CLEAR CREEK MESA MINE AND RETORT AIR QUALITY IMPACTS SUMMARY (F1-100)

Pollutant	Averaging Time	Background ^a Conc. ($\mu\text{g}/\text{m}^3$)	Predicted Class I Impacts		Predicted Class II Impacts		Total Conc. ($\mu\text{g}/\text{m}^3$)	Standards		
			Receptor Location	Increment Conc. ($\mu\text{g}/\text{m}^3$)	Receptor Location	Conc. ($\mu\text{g}/\text{m}^3$)		Class I Increment ($\mu\text{g}/\text{m}^3$)	Class II Increment ($\mu\text{g}/\text{m}^3$)	Limiting NAAQS ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	1	Flat Tops W. Boundary	<1	4-km NNE of Retorts	6	7	2	20	80
	24-Hour	14	Flat Tops W. Boundary	2	4-km NNE of Retorts	28	42	5	91	365
	3-Hour	17	Flat Tops W. Boundary	8	7-km NNW of Retorts	99	116	25	512	1,300
TSP	Annual	15	Flat Tops W. Boundary	<1	2-km N of Mine (R125)	7	22	5	19	60
	24-Hour	89	Flat Tops W. Boundary	2	6-km N of Mine (R147)	32	121	10	37	150
NO _x ^b	Annual	4			6-km NNE of Retorts	46	50	--	---	100
CO	8-Hour	2,500			16-km WSW of Retorts	971	3,471	--	---	10,000
	1-Hour	3,000			11-km NW of Retorts	4,075	7,075	--	---	40,000

Source: Chevron (1982d).

^a Background concentrations representative of facility area. The actual background concentration in other areas may be lower.^b Modeled as total NO_x.

Visibility. A Level-I visibility screening analysis for Arches National Monument was conducted for the FI-100 upgrade facility in Grand Valley. The results of the Level-I calculations, which are discussed in Chevron (1982f), show the proposed upgrading facility is not likely to cause any visibility impairment at Arches National Monument. Other Class I areas which are further away will not show an impact.

A detailed discussion of visibility impacts in the Flat Tops Wilderness Class I area due to mining and retorting is presented in Appendix 7 of Chevron (1982d). Both Level-I and refined analyses are discussed. The Level-I analysis indicates that contrast reduction in the Flat Tops due to haze would be insignificant but that a dark plume blight from project NO_x emissions is possible. Based on these results, a PLUVUE analysis was conducted to determine the plume blight impact more precisely.

The refined analysis for Flat Tops indicates two worst-case meteorological scenarios in which visibility impacts could occur. For the view of Shingle Peak from Blair Lake, the project plume was predicted to be perceptible on 2 days during the visitor season. For the view of Shingle Peak from Marvine Peak, the plume was estimated to be perceptible 1 day. In both cases, some contrast reduction and discoloration were predicted.

Because of the conservative assumptions concerning plume transport to Flat Tops, the intervening rough terrain, and the rarity of predicted impacts, it is possible, but unlikely, that vistas within Flat Tops will actually be impaired due to emissions from the proposed project.

In the immediate vicinity of the project, mining operations will result in localized dust plumes. These plumes should not result in any regional visibility degradation because most of the particles drop out rapidly. The gaseous emissions from the mining activities should not have any significant effect on visibility in the CCOSP vicinity.

Atmospheric Deposition. Table 4.2-6 shows estimated 24-hour and annual dry and wet deposition rates resulting from upgrading in the Grand Valley on Arches National Park, Colorado National Monument, Black Canyon of the Gunnison Wilderness, and the West Elk Wilderness. Table 4.2-6 also shows estimated atmospheric deposition from retorting on the mesa on the Flat Tops Wilderness. A comparative study (SAI 1982) indicates that cumulative maximum deposition in Colorado National Monument will be less than 0.1 grams per square meter per year each for sulfur and nitrogen. Major shifts in pH values in these areas is not expected.

Alternative Production Rates (FI-50)

Available data suggest that reducing the production rate by 50 percent would reduce air quality impacts by a proportional amount. However, specific changes in facility configuration may vary this relationship. Fugitive dust impacts from mining activities would be further reduced due to the use of an all underground mine and less material handled. Maximum SO₂ impacts at Colorado National Monument are estimated to be 10.5 µg/m³ for a 3-hour averaging period and 2.6 µg/m³ for a 24-hour average. These compare to Colorado and PSD Class I standards for SO₂ of 25 µg/m³ for 3 hours and 5 µg/m³ for a 24-hour average, or 40-55 percent of the increment. Predicted 24-hour TSP values of 1.0 µg/m³ are 10 percent of the PSD Class I increment. Values predicted for Dinosaur National Monument are approximately 25 percent less for SO₂ and about equal for TSP to those estimated for Colorado National Monument.

Fruita II Alternative (FII-50)

This section presents the air quality impacts from retorting and upgrading facilities in the Grand Valley at a production rate of 50,000 bpd.

Emissions. Emission and stack data on a per stack basis for a facility upgrading of 74,000 bpd and retorting of 62,000 bpd are presented in Table 4.2-7. Because of methods used in the cracking process at the upgrading facility, the final output can be as much as 12,000 barrels more per 100,000 barrels of syncrude processed (Chevron 1982o).

Table 4.2-6 MAXIMUM GRAND VALLEY AND CLEAR CREEK MESA ELEMENTAL DEPOSITION RATES IN SENSITIVE AREAS (FI-100)

Constituent	Arches National Monument ^a				Black Canyon of ^b Gunnison Wilderness				Flat Tops Wilderness ^b				West Elk Wilderness ^b				Colorado National Monument ^a			
	24-hr (g/ha/d)		Annual (kg/ha/yr)		24-hr (g/ha/d)		Annual (kg/ha/yr)		24-hr (g/ha/d)		Annual (kg/ha/yr)		24-hr (g/ha/d)		Annual (kg/ha/yr)		24-hr (g/ha/d)		Annual (kg/ha/yr)	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Upgrade Nitrogen	<5.6	<5.6	<0.4	<0.4	<5.6	<4.5	<0.4	<0.3	N ^c	N	N	N	<5.6	<4.5	<0.4	<0.3	33.5	33.5	2.3	2.3
Upgrade Sulfur	<4.3	<4.3	<0.3	<0.3	<4.3	<3.4	<0.3	<0.2	N	N	N	N	<4.3	<3.4	<0.3	<0.2	25.8	25.8	1.8	1.8
Retort Nitrogen	N	N	N	N	N	N	N	N	10.1	8.1	0.7	0.6	N	N	N	N	N	N	N	N
Retort Sulfur	N	N	N	N	N	N	N	N	7.3	5.8	0.5	0.4	N	N	N	N	N	N	N	N

^a Wet deposition velocity at Arches National Monument and Colorado National Monument was estimated to be 1.0 cm/sec.

^b Wet deposition velocity at Black Canyon, Flat Tops, and West Elk was calculated to be 0.8 cm/sec.

^c N = Assumed negligible due to distance and meteorological conditions.

As discussed in FI-50, fugitive dust emissions due to mining and ore handling activities will be less than for a 100,000-bpd configuration and hence not significant.

Air Quality. This section presents the results of the COMPLEX I and ISC modeling of the operational phase of the FI-50 upgrading and retorting facility in Grand Valley. Impacts for the underground mine should be less than the mining scenario described earlier. This allows direct comparison of the predicted concentrations to air quality standards. Table 4.2-8 presents the impacts.

All of the predicted maximum annual average and short-term impacts for SO₂ are in compliance with PSD Class II increments. However, the 24-hour TSP concentration slightly exceeds the PSD increment.

Particulate concentration levels in the Mesa County TSP nonattainment area were predicted to be at the level of significance for 24-hour averages. These values are presented in Table 4.2-8.

Information concerning impacts on Class I areas from this alternative and comparative PSD Class I and Colorado Category I increments are also compiled in Table 4.2-8. These data were scaled by emissions linearly from available data presented in the preceding sections. Much of the earlier data were presented as less than 1 $\mu\text{g}/\text{m}^3$. No impacts were predicted for the Flat Tops Wilderness.

Visibility. Visibility impacts at the Colorado National Monument for FI-50 are estimated by EPA Level-1 screening analysis to be the most adverse of any 50,000-bpd scenario. The two contrast parameters against the terrain were calculated to be a factor of 5 to 7 times higher, respectively, than the acceptable guidelines (Latimer and Ireson 1980). This magnitude of failure of the Level-1 screening analysis indicates potentially significant impact on visibility in Colorado National Monument due to the FI-50 configuration. Modeling for Dinosaur National Monument passes the EPA Level-1 screening analysis.

Atmospheric Deposition. Potential deposition of sulfur and nitrogen resulting from estimated concentrations in the Class I and Category I areas from the retorting and upgrading facility located in Grand Valley are presented in Table 4.2-9. These values were scaled by emissions from data supplied for the mine and retorts on Clear Creek mesa and the upgrade facility near Fruita. Major shifts in pH values in these areas are not expected.

4.2.4 Alternative Siting Impacts

Alternative reservoir and corridor siting should not have an air quality impact.

Based on the PSD applications for mining and retorting on the Clear Creek mesa (Chevron 1982d), the spent shale storage piles represent a very small amount (1-5 percent) of the total contribution to total suspended particulates at the locations of overall maximum impact. The concentrations fall off rapidly and are below the PSD Class II increments within 3.5 kilometers of the source. The site location will not affect the air quality impact, which has been determined as a minor negative impact.

4.2.5 Transportation Impacts

Using trains to transport coal for all of the alternative project configurations would require one train a day running about 26 miles and would result in a very low adverse impact. Using trucks to transport coal would require about 450 trucks a day over the same route and would obviously increase the air quality impact.

4.2.6 Solid and Hazardous Waste

Based on an analysis of potentially toxic pollutants that might be emitted from the proposed project, all predicted impacts for identified toxics are minor and below EPA or OSHA standards or guidance. Although technologically new, a range of estimated emissions was evaluated for both organic pollutants such as benzene as well as inorganic constituents such as arsenic, lead, cadmium, etc. It should be noted that some of the estimates contain a high degree of uncertainty, as does any emerging technology that has not advanced beyond pilot stage. However, these uncertainties were considered during the review.

Table 4.2-7 TOTAL RETORTING AND UPGRADING EMISSIONS AND STACK DATA 50,000-bpd PRODUCTION IN THE GRAND VALLEY^a

Facility	Stack Height ^b	No. of Stacks	Emissions per Stack (g/sec)			
			SO ₂	TSP	NO _x	CO
Coal Grinding	Low	3	0	0	0	0
Steam Superheaters	Mid	3	1	0	2	1
Retort Combustor	Upper	3	10	12	103	208
TEG Concentrator	Mid	2	0	0	0	0
Reactor Feed	Mid	4	0	0	1	0
Reactor Charge	Mid	4	0	0	1	0
Fract Tower Reboiler	Mid	2	1	0	3	1
Reformer Furnaces	Mid	4	2	2	11	2
Naptha Vaporizers	Mid	2	0	0	1	0
Feed Gas Preheat	Mid	2	0	0	0	0
BSRU Tail Gas	Mid	2	0	--	--	0
Steam Generator	Upper	2	8	1	30	2
Misc TSP ^c	Low	1	--	2	--	--
Total Emissions			57	49	426	641

Source: Chevron (1982d,f,p).

^a Based on: 2 Upgrading Modules Producing 102,000 bpd

3 Retort Modules Producing 89,000 bpd

^b Low = "low-level emissions" (10-25 m)

Mid = "mid-level emissions" (25-45 m)

Upper = "upper-level emissions" (45-100 m)

^c Stack parameters arbitrarily set to generate negligible plume rise

Table 4.2-8 MAXIMUM GRAND VALLEY UPGRADE AIR QUALITY IMPACTS (FII-50)

PSD Class 1 Predicted Impacts								
Pol.	Avg. Time	Back ^a Conc. ($\mu\text{g}/\text{m}^3$)	Receptor ^b Location	Inc. Conc. ($\mu\text{g}/\text{m}^3$)	Receptor ^b Location	Inc. Conc. ($\mu\text{g}/\text{m}^3$)	Receptor ^b Location	Inc. Conc. ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	3	ARCH E Boun	1	BACA W Boun	1	WELK W Boun	1
	24-Hour	24	ARCH E Boun	1	BACA W Boun	1	WELK W Boun	1
	3-Hour	39	ARCH E Boun	1	BACA W Boun	1	WELK W Boun	1
TSP	Annual	33	ARCH E Boun	2	BACA W Boun	2	WELK W Boun	2
	24-Hour	59	ARCH E Boun	1	BACA W Boun	1	WELK W Boun	1
NO _x ^e	Annual	2						
CO	8-Hour	1,040						
	1-Hour	2,680						

Table 4.2-8 MAXIMUM GRAND VALLEY UPGRADE AIR QUALITY IMPACTS (FII-50) (cont.)

PSD Class II Predicted Impacts			Colorado Cat. I Predicted Impacts			
Pol.	Receptor ^b Location	Conc. ($\mu\text{g}/\text{m}^3$)	Receptor ^b Location	Inc. Conc. ($\mu\text{g}/\text{m}^3$)	Receptor Location	Conc. ($\mu\text{g}/\text{m}^3$)
SO ₂	8.0-km NW of Upgrade	3	COLM N Boun	1	DINO E Boun	NM ^d
	3.5-km SW of Upgrade	31	COLM N Boun	2	DINO E Boun	1
	3.5-km SW of Upgrade	216	COLM Boun	12	DINO E Boun	3
TSP	3.0-km E of Upgrade	3				
	0.8-km E of Upgrade	38 ^f				
NO _x ^g	8.5-km NW of Upgrade	21				
CO	1.0-km SE of Upgrade	842				
	4.2-km W of Upgrade	3,413				

Mesa County TSP Non- Attainment			Standards			
Pol.	Rep. Loc.	Inc. Conc. ($\mu\text{g}/\text{m}^3$)	Class II Total Conc. ($\mu\text{g}/\text{m}^3$)	Class I ^e Inc. ($\mu\text{g}/\text{m}^3$)	Class II Inc. ($\mu\text{g}/\text{m}^3$)	Limit. NAAQS ($\mu\text{g}/\text{m}^3$)
SO ₂			6	2	20	80
			55	5	91	365
			255	25	512	1,300
TSP	NA ^e	1	35	5	19	60
	NA	5	97	10	37	150
NO _x ^g			23	NM ^e	--	100
CO			1,882	--	--	10,000
			6,903	--	--	40,000

Source: Chevron (1982a,z).

^a Background concentrations representative of facility area. The actual background concentration in other impact areas may be lower.^b Four letter acronyms have been used to designate national parks and wilderness areas: ARCH = Arches National Monument, BACA = the Black Canyon of the Gunnison National Monument, WELK = the West Elk Wilderness, COLM = the Colorado National Monument, and DINO = Dinosaur National Monument.^c Colorado Category I Increments are the same as PSD Class I increments for SO₂ only.^d NM indicates this pollutant and averaging time have not been modeled.^e Non-Attainment Boundary line at the Book Cliffs.^f Equal to or exceeds PSD Increment.^g Modeled as total NO_x.

Table 4.2-9 ATMOSPHERIC DEPOSITION IN PSD CLASS I AREAS AND COLORADO CATEGORY I AREAS FROM THE UPGRADING AND RETORTING FACILITY IN GRAND VALLEY

Constituent	Black Canyon of Arches National Monument ^a				Gunnison Wilderness ^b				Flat Tops Wilderness ^b			
	24-hr (g/ha da)		Annual (kg/ha yr)		24-hr (g/ha da)		Annual (kg/ha yr)		24-hr (g/ha da)		Annual (kg/ha yr)	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Nitrogen	8.5	8.5	0.5	0.85	8.5	7.0	0.5	0.5	0	0	0	0
Sulfur	1.7	1.7	0.1	0.1	1.7	1.4	0.1	0.1	0	0	0	0

Constituent	West Elk Wilderness ^b				Colorado National Monument			
	24-hr (g/ha da)		Annual (kg/ha yr)		24-hr (g/ha da)		Annual (kg/ha yr)	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Nitrogen	8.5	7.0	0.5	0.5	51.5	51.5	3.5	3.5
Sulfur	1.7	1.4	0.1	0.1	10.3	10.3	0.7	0.7

Source: Chevron (1982d).

^a Wet deposition velocity at Arches National Monument and Colorado National Monument was estimated to be 1.0 cm/sec.

^b Wet deposition velocity at Black Canyon, Flat Tops, and West Elk was calculated to be 0.8 cm/sec.

The analysis involved evaluating the impacts for hazardous gaseous and particulate pollutants as compared to the predicted impacts for the criteria pollutants from the air quality modeling. As an example, benzene emissions from the retorts are estimated to be 627 tons per year (tpy) while SO₂ emissions are estimated to be 3,503 tpy. Predicted maximum 3-hour SO₂ impacts are 0.04 ppm, which indicates that predicted three hour benzene levels would be less than 0.01 ppm. All species analyzed have predicted values below existing OSHA or EPA standards.

This conclusion is based on a review of the potential emissions presented in Chevron 1983b, as well as the information contained in the PSD applications (Chevron 1982d,f). It should be noted that due to the relatively early stage of oil shale technology development, especially the Chevron STB process, only limited data is available concerning the emission of these potentially toxic substances. However, as noted in the Uinta Basin Synfuels (UBS) Development Final EIS, the risk is very small (BLM 1983) for a 1,000,000 barrel per day industry. The UBS risk calculation covered project workers, the existing population, and people moving into the area. Additional data sources included the *Oil Shale Technical Data Handbook* (Moyes 1981) and *Environmental Perspective on the Emerging Oil Shale Industry* (EPA-600/2-80-205a),

4.2.7 Secondary Impacts

Retorting and Mining on Clear Creek Mesa (PA-100/CC-100)

This section presents the estimated air quality impacts from secondary growth emission sources associated with the construction and operation of the mine and retorting facility on Clear Creek mesa. The secondary growth sources included in the analysis are increased space heating requirements and increased motor vehicle traffic in the De Beque area.

The emission estimates from increased space heating and transportation requirements are presented in Table 4.2-10. Space heating emissions were calculated by assuming each new household was a consumer of natural gas and used 115,000 standard cubic feet of gas per customer year (COEC 1982). Emission factors for natural gas combustion were derived from EPA's compilation of emission factors (EPA 1977). Vehicle exhaust emissions were calculated from national average emission factors. It was assumed that each household operated an average of two vehicles and each vehicle averaged 12,000 miles traveled per year. As the tables show, the highest emissions are expected in 1992. The air quality impacts of the 1992 projected emissions were estimated with the highly conservative screening technique outlined below.

Table 4.2-10 MAXIMUM ANNUAL SECONDARY EMISSION RATES IN DE BEQUE (PA-100/CC-100)

Source Type	SO ₂ (ton/yr)	TSP (ton/yr)	NO _x (ton/yr)	CO (ton/yr)	HC (ton/yr)
Space Heating (6,200 hrs)	0.5	2	29	7	3
Transportation	38	98	1,312	4,888	771

Source: Chevron (1982d).

A worst-case episode was considered to estimate the highest short-term concentrations possible in De Beque from the projected 1992 secondary emissions. The scenario assumes all motor vehicle emissions from 3 pm one day until 9 am the next morning are trapped over the De Beque area. In addition, continuous space heating emissions are added to the vehicle emissions. The meteorological conditions assumed are a regional high pressure stagnation condition, with zero ventilation. Thus, pollutants emitted during the 18-hour period are assumed to accumulate over the town, and then be fumigated down to the ground and fill a well-mixed box surrounding De Beque. A 32-square-mile area surrounding De Beque was assumed for the well-mixed region. To add to the conservatism, the vertical extent of the mixed region was taken as only 200 meters (650 feet). The worst-case short-term concentrations were then calculated as the total amount of pollutant mass released during the period divided by the volume of the well mixed box as for the Grand Valley upgrading secondary growth estimates.

The uniform hourly concentration estimates calculated using the above worst-case dispersion episode are 95, 3, 345, 55, and 7 $\mu\text{g}/\text{m}^3$ for NO_x, SO₂, CO, HC, and TSP, respectively. Except for NO_x, these concentrations are at the level of background concentrations, and are insignificant.

Extrapolating the NO_x concentration to an annual average using a factor of 0.6 as recommended (USEPA 1974) results in a concentration of 6 $\mu\text{g}/\text{m}^3$, or only 6 percent of the annual NO₂ NAAQS. Thus, the NO₂ impacts are also expected to be insignificant.

Upgrading in Grand Valley (FI-100)

Data for addressing secondary impacts associated with the upgrading facility in Grand Valley and those associated with the mine and retorting facilities on Clear Creek mesa are discussed in the PSD application (Chevron 1982d,f) and are briefly summarized below. Table 4.2-11 presents secondary emissions related to project growth.

Construction and operation in Grand Valley would result in a general area-wide population expansion and generate an increase in the emission of air pollutants in the region, particularly in urban areas. For the purpose of estimating the secondary air quality impacts associated with this facility, population forecast figures have been drawn from the upgrading PSD application (Chevron 1982f). The expected population increase is a function of the increased work force associated with the facility. The work force projection fluctuates throughout the life of the project, but peaks in 1993 at 2,000 additional jobs. Population increases can be estimated by assuming an average of one family unit per worker, or a total of 2,000 family units. It was assumed in the PSD application that 80 percent of these families will take up residence in the greater Grand Junction area, and 20 percent will live in Fruita and other smaller communities.

Two major emission sources will result from the projected population increase: (1) space heating and (2) vehicular exhaust. Space heating emissions were calculated by assuming each of the new 2,000 family units will be a residential user of natural gas and the average natural gas consumption will be 130,000 cubic feet per customer year (U.S. Department of Commerce 1979; EPA 1977b). Vehicle exhaust emissions were calculated using high altitude vehicle emission factors for NO_x , CO, and HC (EPA 1978a) and EPA's compilation of air pollutant emission factors (1977b) for SO_2 and TSP matter. National average vehicle age mixes and mileage accumulation rates projected for the year 1993 were used (EPA 1978a). It was assumed that the 2,000 families operated two vehicles each, and that 75 percent of the vehicles were gasoline-powered automobiles, and 25 percent of the vehicles were light-duty gasoline-powered trucks (less than 6,000 pounds). Table 4.2-12 summarizes the 1993 projected emissions increase in Grand Junction and Fruita from secondary growth.

Air quality impacts from these emissions were calculated using box modeling techniques. (Appendix B-2 presents additional discussion on this methodology.) Table 4.2-12 summarizes the results of the box model calculations. Impacts of TSP, SO_2 , and CO emissions for both Grand Junction and Fruita were estimated to be well below the EPA significance levels. Impacts of NO_x and HC were also calculated to be very small, less than $1 \mu\text{g}/\text{m}^3$. These results lead to the conclusion that secondary growth-related emissions associated with the proposed upgrading project should have minimal impacts on regional air quality, particularly in Grand Junction and Fruita.

Table 4.2-11 MAXIMUM ANNUAL SECONDARY EMISSIONS IN GRAND JUNCTION AND FRUITA

	(Tons/Year)				
	SO_2	TSP	NO_x	CO	HC
Grand Junction					
Space Heating	<1	1	9	2	1
Vehicle Exhaust	10	26	61	645	66
TOTAL	10	27	70	647	67
Fruita					
Space Heating	<1	<1	2	1	<1
Vehicle Exhaust	2	6	15	161	16
TOTAL	2	6	17	162	16

Source: Chevron (1982f).

Table 4.2-12 MAXIMUM SECONDARY GRAND VALLEY AIR QUALITY IMPACTS SUMMARY (FI-100)

City	Pollutant	Averaging Time	Growth-Related Impact ($\mu\text{g}/\text{m}^3$)
Grand Junction	SO ₂	3-hr	<1
		24-hr	<1
	TSP	24-hr	<1
	NO ₂	1-hr	<5
	CO	8-hr	3
	HC	1-hr	4
		3-hr	<1
Fruita	SO ₂	3-hr	<1
		24-hr	<1
	TSP	24-hr	<1
	NO ₂	1-hr	<5
	CO	8-hr	3
	HC	1-hr	4
		3-hr	<1

Source: Chevron (1982f).

4.4 Water Resources

4.4.1 Surface Water

4.4.1.1 General Impacts

Major surface water impacts due to development of the CCSOP relate primarily to water quantity, water quality, and changes in the physical configurations of drainage channels. Water withdrawals from surface streams would deplete stream flow of the Colorado River and increase salinity. Water storage reservoirs may pose potential hazards to downstream communities in the unlikely event of dam failure. Surface mining may alter stream channels and mine through springs and seeps. Specific CCSOP impacts on surface water may include increases in total suspended solids, total dissolved solids, sedimentation, and peak flows of storm runoff events.

Spent shale disposal may pose potential water quality impacts to Big Salt Wash due to leachates and surface runoff from the spent shale pile. Runoff storage reservoirs could reduce stream flows during low flow periods. In addition, all reservoirs would tend to attenuate peak runoff events through water storage and controlled release. Also, minor stream channel configuration changes may occur upstream and downstream of the reservoir sites due to sediment deposition and channel erosion.

Withdrawals of ground water from alluvial aquifers could deplete stream flows of Roan Creek, and possibly Clear Creek downstream of the Tom Creek confluence. Construction of various pipelines and corridors could cause stream flow disruption at the stream crossing and increase the potential for soil erosion and sedimentation.

Accidental spills and leakage from syncrude pipelines may pollute streams crossed by the pipelines. Finally, facility construction (e.g., pipeline, access road, site development) could disturb numerous acres of watershed, causing potential increases in soil erosion and flood flows.

The above general impacts are discussed below as they relate specifically to Clear Creek mesa and Grand Valley activities.

4.4.1.2 Clear Creek Mesa and Associated Siting Activities

Proposed Action (PA-100)

Surface Mine. Surface mine development (including overburden disposal) would disturb a total of 8,400 acres of land for approximately 90 years (Moore 1982c). The drainages that would be disturbed include Mud Springs Creek, Cottonwood Creek, No Name Creek, Willow Creek, East Willow Creek, and West Willow Creek. A total of 16 springs and seeps which contribute to the stream flow of these drainages would be mined through and eliminated (Figure 4.4-1; Table 4.4-1). Each spring or seep contributes an estimated flow of less than 0.1 cubic feet per second (cfs) to the stream channels. The impacts of disturbance of springs and seeps on stream flows could be significant during low flow periods. In addition, the stream channels of Mud Spring Creek, Cottonwood Creek, No Name Creek, and Willow Creek would be completely altered as a result of surface mining. Segments of East Willow Creek and West Willow Creek within the Clear Creek property would also be mined through. These drainages contribute about 8.7 percent of Clear Creek flows at station CJ-23 according to 1981 water year stream flow data (Chevron 1982h).

The surface runoff management plan for the surface mine is designed to (1) collect all water passing through mined and disturbed areas in sedimentation reservoirs (Figure 4.4-2), (2) retain and divert surface runoff upstream of the mine site to avoid interruptions of mining activities, and (3) collect all off-site drainage and route it around the mining areas. This management plan should minimize any flood hazard to the mining operation.

It is estimated that soil erosion prior to reclamation activities would be 64 acre-feet per year (Moore 1982c). Revegetation to cover the area of disturbed land and waste piles should start as early as possible. The sedimentation reservoir, which would be constructed in Clear Creek canyon below the confluence of Willow Creek, has a design dead storage capacity of 90 acre-feet for annual sediment storage (Chevron 1982i). The sedimentation reservoir is designed as a zero discharge system and the stored water would be used for dust control. Sediment stored in the reservoir would be removed on a regular basis to increase its storage capacity and to decrease the likelihood of uncontrolled releases of sediment-laden water during major runoff events.

It is difficult to predict the quality of the surface runoff from the mine site and disturbed areas. However, water in contact with the mine area would likely be high in total suspended solids. Mine water from the south side of the open pit backfill would be routed to the plant water treatment system. The remaining runoff water would be diverted to the sedimentation reservoir to settle out suspended solids. The potential impact on water quality in lower Clear Creek would be minimal except during high runoff events. The release of reservoir water during overflow may contribute to the suspended solids of stream flows.

Underground Mine. The underground mine would cover an area of 3,600 acres at an average depth of 600 feet below ground level. Surface disturbance would be limited to 15 acres. The impacts on the drainage basin, water quality, and water quantity would be minimal provided that an appropriate runoff diversion scheme around the disturbed area is developed.

Plant Site. Plant site development would require excavation, fill, and embankment placement for the feed stock preparation facilities, retort units, upgrading facilities, and other support facilities. The total disturbed area around the plant site would encompass 850 acres. Soil erosion due to runoff events would be a main concern during the construction and operation stages. The quality of runoff water from the plant site can be best estimated by the known quality of runoff water from a Chevron refinery, as shown in Table 4.4-2 (Moore 1982f). Concentrations of calcium, bicarbonate, and sulfate are relatively high when compared with other parameters.

In addition, wastewater generated from the process plant and ancillary facilities would include effluent from the oil separation unit, cooling tower and boiler blowdown, clarifier sludge, filtration backwash, demineralizer waste, wash waters from boiler feedwater treatment, sour water from retort and upgrading facilities, and sanitary wastewater. All collected waters would be sent through the water treatment system before being used for spent shale conditioning. Water quality impacts on streams would be minimal. Spills of water containing oil from the process area drainage pond and API surge basin could cause water quality impacts on streams. This impact can be minimized by appropriate spill prevention and mitigation measures as required by the EPA.

Table 4.4-1 IDENTIFIED SPRINGS AND SEEPS WITHIN THE CLEAR CREEK PROPERTY BOUNDARY THAT WILL BE AFFECTED BY MINING^a

Identification	Elevation (ft)	Approximate Flow (cfs)	Comments
CS-14	8,120	0.1	Seep
CS-19	7,990	0.1	Seep emerging from rate shelf
CS-20	7,940	0.1	Undeveloped spring
CS-21	7,940	0.1	Undeveloped spring
CS-22	8,110	0.1	Seep
CS-23	8,120	0.1	Developed spring
CS-24	8,100	0.1	Developed spring
CS-25	7,990	0.1	Seep
CS-26	7,760	0.1	Seep
CS-29	8,020	0.1	Large, well defined seep
CS-30	8,020	0.1	Concentrated seep
CS-31	8,020	0.1	Multiple springs
CS-32	8,030	0.1	Seeps
CS-33	7,960	0.1	Small spring
CS-34	8,030	0.1	Two small seeps
CS-38	7,740	0.1	Multiple seeps

Source: Chevron (1982h).

^a Majority of visible springs and seeps were identified during helicopter flights and ocular estimates of flow contribution were made during 1981.

Corridors. Impacts on water resources due to construction of all corridors may be significant during the short term. Soil erosion/sedimentation and stream flow disruption are expected, especially at the intersections of corridor crossings and stream drainageways. These corridors would cross numerous washes, creeks, and streams. Table 4.4-3 lists the names and types of the drainages that would be affected by the various corridors. The Roan Creek, Big Salt Wash, and Parachute Creek corridors would disturb two perennial (Colorado River and Roan Creek), seven intermittent, and two ephemeral streams.

Accidental spills from the syncrude pipeline could impact the environment. The spill volume, frequency, and rate of discharge depend on the pipeline length and operation year of the pipeline. The national average annual accident rate is about 0.001 accidents per mile of pipeline (BLM 1981c). Based on the La Sal syncrude pipeline length of approximately 27-28 miles, the average leak frequency would be on the order of one leak every 35 years (or 0.028 accidents per year) for the system. Using the projected throughflow of 36.5 million barrels per year at 100,000 bpd, the predicted total spills in a given year would be approximately 130 barrels, based on the formula

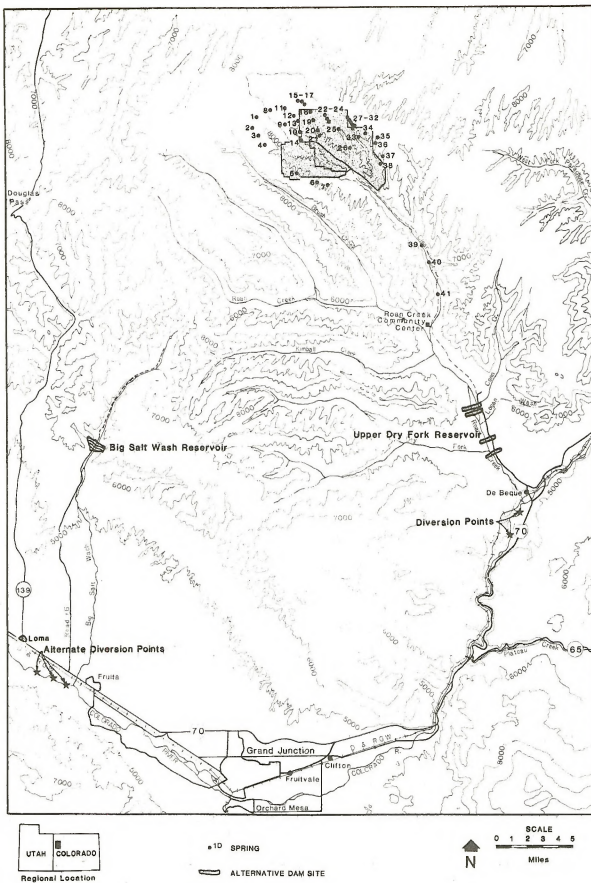


Figure 4.4-1 Location of Springs, Alternative Diversion Points, and Dam Sites.

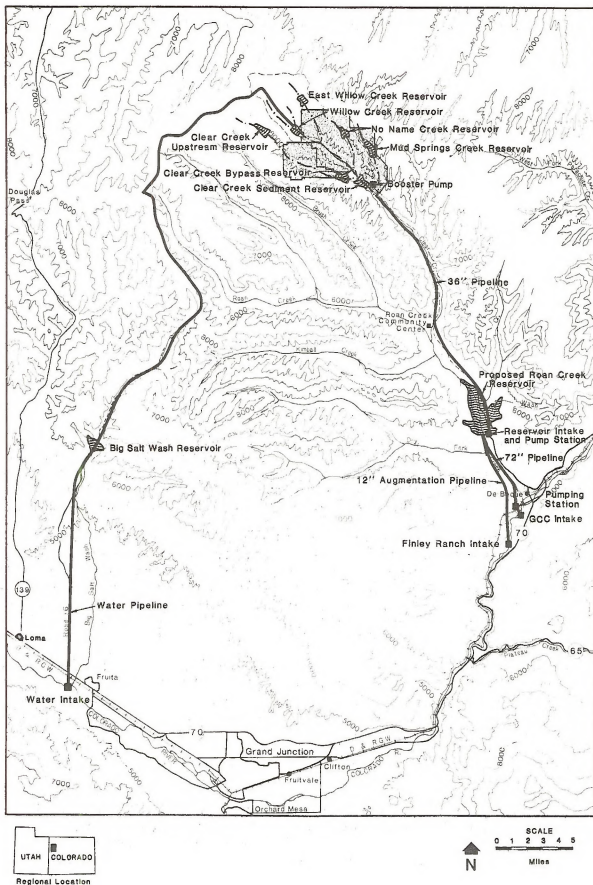


Figure 4.4-2 Location of Proposed CCSP Water Facilities.

Table 4.4-2 SURFACE RUNOFF WATER QUALITY FROM A CHEVRON REFINERY

Parameters	Concentration Range (ppm)
Sodium	5 - 70
Calcium	17 - 135
Magnesium	5 - 26
Potassium	3 - 69
Carbonate	240
Bicarbonate	88 - 451
Nitrate	1 - 4
Sulfate	8 - 375
Chloride	5 - 40
Sodium Adsorption Ratio	0.2 - 0.8

Source: Moore (1982f).

developed by Beyer and Painter (BLM 1981c). The average spill size would be about four barrels based on the spill frequency of 0.028 spills per year. The spilled oil may damage vegetation, contaminate soils, or pollute stream water. Such an event could occur as a result of accidental damage during excavation near the alignment, improper operation, stream washouts, geological hazards, or sabotage. The watersheds that could be affected due to leakage include West Fork Parachute Creek, Clear Creek, Willow Creek, Wolf Creek, and Wiese Creek.

Upper Dry Fork Reservoir. As explained in Section 2.3, a full scale GCC joint venture facility would be required to meet Phase II commercial shale oil production. The Roan Creek reservoir (Upper Dry Fork site) would be constructed to provide the necessary storage capacity for the GCC water supplies. The reservoir could be built under a plan of staged construction. The first stage storage capacity of this reservoir would most likely be in the range of 30,000-70,000 acre-feet. This storage capacity could be reduced if Ruedi Reservoir water is used by CCSOP to supplement supply when their water rights are not in priority to divert. However, the ultimate storage capacity could be as much as 175,000 acre-feet, depending on future needs,

To estimate the possible effects of diverting stream flow from the Colorado River, a stream flow analysis was performed for the Colorado River near De Beque. The mean annual flow of the Colorado River near De Beque is 2,612,000 acre-feet (Table 3.4-1). Based on an estimated annual water withdrawal of 24,000 acre-feet for CCSOP and 73,000 acre-feet for the GCC joint venture, approximately 1.0 percent and 3.0 percent of the mean annual flow could be diverted, respectively. During low flow, water may not be available for diversion from the Colorado River to the storage reservoir on Roan Creek due to the relatively junior status of GCC's direct diversion appropriations. Senior water users downstream of the proposed diversion would have a decreed prior right to water use.

Salinity is currently a problem within the Colorado River Basin. The operation of the proposed water supply reservoir may increase salinity in the Colorado River. As a result of the diversion and consumptive use of stream flow, the remaining salt load would be concentrated in a smaller volume of water. Based on the rate of diversion withdrawal and stream discharge, the concentration of dissolved solids would vary.

Table 4.4-3 LOCATION AND STREAM TYPE OF DRAINAGES AFFECTED BY CCSOP CORRIDORS

Corridors	Affected Stream	Stream Type
Roan Creek - De Beque to Clear Creek Mesa	Colorado River Roan Creek Clear Creek Cottonwood Creek	Perennial Perennial Intermittent Intermittent
Big Salt Wash - Fruitita to Clear Creek Mesa	Colorado River Big Salt Wash Grand Valley Canal East Branch Reed Wash Coyote Wash	Perennial Intermittent Irrigation Canal Ephemeral Ephemeral
La Sal - Clear Creek Mesa to Davis Point	West Fork of Parachute Creek Wolf Creek West Willow Creek East Willow Creek	Intermittent Intermittent Intermittent Intermittent
Rangley A Corridor	Soldier Creek Lake Creek Cathedral Creek East Douglas Creek White River Douglas Creek	Perennial Perennial Intermittent Perennial Perennial Perennial
Rangley B Corridor	Douglas Creek White River	Perennial Perennial
SOPS Syncrude Pipeline Lisbon Connection	Clear Creek Buck Gulch Wiesse Creek Sheep Gulch	Intermittent Ephemeral Intermittent Ephemeral
Douglas Pass Road Multi-Purpose Corridor	Coyote Wash Reed Wash Grand Valley Canal Mack Wash	Ephemeral Ephemeral Irrigation Ditch Ephemeral
Dorchester Railroad Alternative	East Salt Creek Mack Wash Coyote Wash	Intermittent Ephemeral Ephemeral
Big Salt Wash to SOPS Syncrude Pipeline	East Salt Creek Mack Wash Coyote Wash Dry Canyon Wash	Intermittent Ephemeral Ephemeral Ephemeral
Roan Creek Railroad Corridor	Roan Creek	Perennial

The potential impact of stream diversions on salinity concentrations in the Colorado River is presented in Figure 4.4-3. The formula used in calculating the salinity changes was obtained from the U.S. Bureau of Reclamation (USD1 1982). Based on the projected water uses of 24,000 acre-feet/year (66 acre-feet/day) for the CCSOP and 73,000 acre-feet/year for the GCC joint venture, salinity of the Colorado River at the Imperial Dam in the year 2010 would increase by 1.6 mg/l and 4.8 mg/l, respectively. Salinity impacts on the Colorado River would be minimal, based on these calculated salinity changes.

The operation of a water storage reservoir on Roan Creek may have positive impacts on the water quality of Roan Creek downstream of the reservoir site. Changes in water quality may include decreased concentrations of bacteria, dissolved solids, and suspended sediment (Hannan 1979). These changes would be dependent upon the

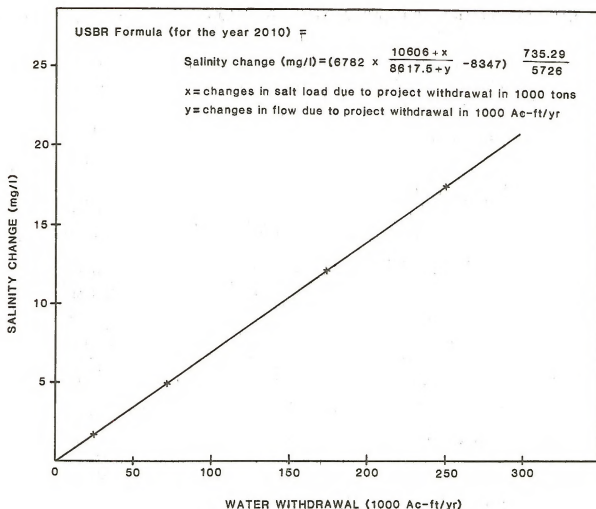


Figure 4.4-3 Salinity Changes of the Colorado River at the Imperial Dam for the Year 2010 due to the Water Withdrawal by the GCC Joint Venture.

size and depth of the reservoir and the quality of the influent stream flow. Also, minor stream channel configuration changes may occur upstream and downstream of the reservoir site. Upstream of the reservoir, sediment could be deposited along the channel, while the channel below the dam site could be degraded due to the increased erosivity of the stream flow (EPA 1975; Simons 1979).

In addition to the potential hydrologic impacts of the proposed storage reservoir, the actual operation of the reservoir may pose a safety concern for the downstream inhabitants of De Beque. The proposed dam would be constructed as zoned earth-fill with underseepage control, an emergency spillway, and a gated outlet-works.

The probability of the storage reservoir dam being breached due to structural failure is small. The probability of failure of a specific dam is difficult to assess precisely; it is dependent on the conditions of dam design, construction, maintenance, operation, and foundation materials. The historical records support an average annual probability of about 10^{-4} failures per dam year (which means the probability of dam failure within any given year would be 0.01 percent) for major projects in the United States (Baecher et al. 1980).

To simulate the failure of the proposed dam at the Upper Dry Fork site, a storage volume of 175,000 acre-feet and dam height of 205 feet were assumed. It is estimated that the peak discharge under the totally breached

condition could be 1.32×10^6 cfs. The mean velocity of the flow was estimated to be 15.1 feet/second, with a travel time for the peak discharge from the dam site to De Beque of approximately 23 minutes. At peak discharge the width of the flood zone would range from 1,700 to 6,700 feet and cover a significant portion of the lowland valley. Flow depths within the floodplain would range from 26 to 33 feet. At De Beque (4 miles downstream of the dam site), the mean depth of flow through the town could range from 25 to 35 feet with a mean flow velocity of approximately 4.3 feet/second.

Big Salt Wash Reservoir. The Big Salt Wash storage reservoir would be located on Big Salt Wash downstream of the Garvey Canyon confluence, approximately 15 miles north of Fruita. The proposed dam would have a maximum height of 165 feet and a length of 1,700 feet. The total capacity of the reservoir at the spillway crest would be 12,000 acre-feet, with an active capacity of 10,000 acre-feet.

Water stored in the reservoir would be diverted from the Colorado River at a point near the town of Loma. No historical discharge records exist for the Colorado River near Loma or Fruita. Based on the stream flow records for the Colorado River near the Colorado-Utah state line, the mean annual flow from 1951 to 1980 was about 4,193,000 acre-feet (USGS 1981). The stream flow and salinity impacts on the Colorado River would be minimal due to the small reservoir size and the diversion system.

It is estimated that the peak discharge due to dam failure could be about 7.25×10^4 cfs for the Big Salt Wash reservoir. Compared to the calculated peak flood discharge for the proposed Roan Creek reservoir (1.32×10^6 cfs), the peak flood discharge for Big Salt Wash would be orders of magnitude less due to smaller reservoir size. Also, the Big Salt Wash reservoir would be located approximately 15 miles upstream from the nearest major population center (Fruita). The valley of Big Salt Wash gently slopes from the base of the damsite to the Colorado River. The width of the valley ranges from 600 feet near the base of the damsite to greater than 2 miles near its confluence with the Colorado River. Both the travel time of flood flow and the volume of the flow would be attenuated by the length of the valley and the gentle channel slope. Flooding due to dam failure could damage pipelines, irrigation ditches, agricultural land, and houses in the Fruita area.

Clear Creek Mesa Water Diversion and Storage Reservoirs. The surface runoff management plan for Clear Creek mesa includes several water diversion dams (Figure 4.4-2). Specifications for these dams and reservoirs are listed in Table 4.4-4. Water stored in these reservoirs would be used for mining, retorting, upgrading, spent shale conditioning, dust control, and domestic uses. Impacts due to the on-site runoff storage reservoirs would include reduction of stream flows in lower Clear Creek and hydrologic disruption of drainages on top of Clear Creek mesa. The Clear Creek sedimentation reservoir would be used as the downstream water runoff control of all the mining activities on top of the mesa. Surface runoff and seepage flowing through the mine area would be retained in the reservoir to allow for sediment settlement and project water supply. With a dam height of 81 feet, the reservoir is designed to store 100-year, 24-hour storm events. For any higher recurrence interval flood events, the release of reservoir water would also release sediment into Clear Creek. A portion of the sediment would be deposited along the creek channel bottom but the rest would be carried downstream, causing water quality degradation of Clear Creek and Roan Creek.

The Clear Creek by-pass reservoir, located upstream of the sedimentation reservoir, would collect all the upstream runoff diverted from upper Clear Creek and West Willow Creek, plus that water routed through the underground mine panels. The dam is designed for 100-year, 24-hour storm runoff events with a dam height of 115 feet and storage capacity of 1,430 acre-feet.

Runoff stored in the Clear Creek by-pass reservoir would be used as part of the project water supply. Potential water quality and stream flow impacts associated with this reservoir operation were discussed under spent shale disposal. Because of the proximity of the by-pass reservoir and sedimentation reservoir, water releases from these two reservoirs may have cumulative impacts on flood peak and stream channel disruption of Clear Creek for any runoff events larger than the 100-year, 24-hour design events.

Well Field System. The well field system would include approximately 33 wells: 21 along the Clear Creek valley, 4 in Roan Creek valley, and 8 on top of Clear Creek mesa. Wells on top of the mesa would be deep, ranging from

370 to 790 feet. Water would be withdrawn at an approximate rate of up to 200 acre-feet/year from the aquifer waters of the Mahogany Zone, Parachute Creek Member, and Green River Formation. Impacts on surface stream flows would be negligible. The four wells along Roan Creek would withdraw water from the alluvial aquifer underlying Roan Creek at a maximum rate of 2,000 gallons per minute (gpm; 4.46 cfs) from each well. This well system would be used to augment the yield of Clear Creek mesa and the alluvial well system and to protect senior downstream appropriators. The alluvial aquifer appears to be in direct communication with Clear Creek below Tom Creek (Chevron 1982h). Wells located along Clear Creek canyon would withdraw up to 6,700 acre-feet annually from the alluvial aquifer underlying the stream channel bed. It is expected that the ground water withdrawal would deplete the alluvial aquifer storage and Roan Creek stream flow. The percentage of stream flow depletion would depend on recharge conditions, total pumpage, and Clear Creek stream flows.

Table 4.4-4 SPECIFICATIONS OF ON-SITE RUNOFF STORAGE RESERVOIRS

Reservoir Name	Location	Storage (acre-ft)	Dam Height × Length		Pipeline Diversion Claimed (cfs)	Crest Elevation (ft)	Source	
			(ft)	(ft)				
Clear Creek Upstream Reservoir	SW¼, SW¼ Sec. 3 T5S, R99W	100	30	×	300	15	7,825	Clear Creek
Clear Creek By-Pass Reservoir	NW¼, NW¼ Sec. 17 T5S, R98W	1,430	115	×	650	15	6,665	Clear Creek & West Willow Creek
Clear Creek Sedimentation Reservoir	NW¼, NE¼ Sec. 17 T5S, R98W	1,000	81	×	680	30	6,541	Clear Creek & Willow Creek
Willow Creek Reservoir	NE¼, NW¼ Sec. 1 T5S, R99W	450	60	×	380	10	7,783	Willow Creek & East Willow Creek
East Willow Creek Reservoir	SW¼, NE¼ Sec. 26	40	20	×	200	5	8,023	East Willow Creek
No Name Creek Reservoir	SW¼, NW¼ Sec. 5 T5S, R98W	110	55	×	200	5	7,707	No Name Creek
Mud Springs Creek Reservoir	SW¼, NE¼ Sec. 9	50	30	×	300	5	7,600	Mud Springs Creek
Big Salt Wash Reservoir	SW¼, NE¼ Sec. 12 T8S, R102W	12,000	165	×	1700	125	5,505	Big Salt Wash & Colorado River
Roan Creek GCC Reservoir (Upper Dry Fork)	S¼, S¼ Sec. 6 T8S, R97W	175,000	225	×	3700	442.25	5,320	Colorado River & Roan Creek

Source: CDNR (1981a).

Spent Shale Disposal. Spent shale from underground workings and the initial open pit mine would be deposited within upper Clear Creek canyon, above the water fall, to an approximate elevation of 8,100 feet, or about the elevation of the existing ridgetop. The volume of spent shale to be deposited within Clear Creek canyon is 604 million cubic yards, which would cover a total area of approximately 1,682 acres. Spent shale from the remaining open pit mine would be backfilled into the pit as the mine workings progress. The design of the spent shale pile includes plans to control erosion, surface runoff, and slope stability. Revegetation would begin in 1987 and continue throughout the life of the project. Potential impacts on watershed drainages prior to revegetation

include soil erosion and degradation of water quality. Long-term surface water impacts would include stream channel disruption, water quality degradation, and sediment deposition along the drainageway if a failure of the spent shale pile occurs.

Spent shale leachates are a potential environmental concern which may have a long-term impact on surface water quality. Percolating water from rainfall and snowmelt, or groundwater intrusion into the waste pile could migrate through the spent shale disposal site and dissolve a portion of the spent shale matrix. This organic and mineral-laden water could migrate to underground aquifers and eventually drain to surface water sources. Surface water quality changes due to spent shale leachates are difficult to estimate due to the complexity of geochemical process in the leaching system. However, it is expected that concentrations of TDS, TOC, fluoride, and sodium could increase slightly (U.S. Army Corps of Engineers 1982).

The surface runoff control plan includes diverting stream flow from West Willow Creek and upper Clear Creek, routing the water through the abandoned underground workings, and then returning it to the natural water course below the Clear Creek waterfall. Potential impacts associated with this diversion scheme are twofold. First, stream flow routed through the underground workings may be contaminated by contact with raw shale and other residue such as oil and grease, dust, and ammonium nitrate from explosives. Second, the stream channel segment of Clear Creek, flowing through the spent shale disposal and underground mine area, is composed of thick alluvial deposits. More than 217 acre-feet of the annual mean stream flow between gaging stations CI-13 and CI-14 are retained as alluvial channel storage during low flow periods. Diverting the runoff through the underground mine would reduce the alluvial channel storage.

Clear Creek Alternative (CC-100)

This alternative eliminates the Big Salt Wash reservoir and the water pipeline corridor from the Colorado River near Loma to Clear Creek mesa as presented in the Proposed Action. Therefore, there would be no surface water impacts on the Grand Valley area or any potential impacts on the Colorado River due to the Big Salt Wash reservoir. Other surface water impacts would be the same as discussed for the Proposed Action.

Production Rate Alternatives (PA-50, CC-50)

The 50,000-bpd alternatives for Clear Creek mesa would lack the Willow Creek, No Name Creek, and Mud Springs Creek surface runoff control reservoirs, along with the surface mine. Surface water impacts would be same as for the PA-100 Alternative except for the three streams identified above. Potential stream sedimentation impacts due to soil erosion in the surface mine area would be less for a 50,000-bpd alternative. In addition, those springs located in the area of the surface mine would not be impacted.

4.4.1.3 Grand Valley and Associated Siting Activities

Fruita I Alternative (FI-100)

Impacts on surface water from the project components on top of the Clear Creek mesa and the associated corridors and reservoir would be the same as those of the Proposed Action. The Grand Valley upgrading site would include not only the upgrading facilities but also additional support facilities such as a natural gas pipeline, transmission line, access road, syncrude pipeline, railroad corridor, and an intertie pipeline. These facilities would cause some impacts on the Big Salt Wash drainage system.

The upgrading facilities would occupy about 400 acres in the Grand Valley area (Chevron 1982c). Water courses located within the proposed off-site upgrade location include Big Salt Wash, Mack Wash, and Coyote Wash. Since the channel gradient is low with wide meanders, significant water loss presently occurs from evaporation and infiltration into the valley alluvium. Short reaches of surface flow are separated by reaches of saturated streambed with no surface flow. Therefore, impacts of the upgrading facilities on the watershed or stream flows would be very minimal. The only potential impact would come from accidental leakage which may cause a water pollution problem on irrigated land. Appropriate design of an on-site drainage collection system and spill prevention plan should alleviate the potential impacts.

Wastewater generated from the Fruita upgrading operation would be treated through a wastewater treatment system. The effluent would then be piped to the Clear Creek mesa plant site via the water pipeline, which diverts the water from Colorado River for project water supply.

Impacts due to the corridors along Big Salt Wash would include soil erosion, sedimentation, and stream flow disruption during construction. An accidental spill from a syncrude pipeline connecting upgrading facilities to the Clear Creek mesa is a possible impact. Water resources which may be affected by an accidental spill include Big Salt Wash, Echo Lake, Ruby Lee Reservoir, numerous springs, and stock ponds.

Fruita II Alternative (FII-50)

The feed preparation, retorting, and upgrading activities would disturb approximately 800 acres of watershed in the Grand Valley area. Since Big Salt Wash and its tributaries in the vicinity of the plant site are either intermittent or ephemeral, impact of these facilities on average stream flows would be insignificant. However, flood flows would increase due to the surface disturbance, which reduces the vegetation cover and runoff retention potential. Soil erosion would also increase during runoff events. Runoff water would have high concentrations of suspended solids, dissolved solids, oil, and grease from the plants and equipment.

Surface water impacts of the ore-haulage railroad (Straight Line Tunnel Route) during construction would include soil erosion, sedimentation, stream flow disruption, and increased total suspended solids. A backwater effect on Carr Creek and Brush Creek might occur during flood flow events due to the bridges across the creek. An accidental oil spill from the syncrude pipeline could contaminate stream water. Since the pipeline length is approximately equal to the La Sal pipeline route, the spill volume, frequency, and size would also be approximately the same as described in Section 4.4.1.2.

Potential impacts on surface water for other project components would be the same as those for the Proposed Action. Minor impacts would be expected for Carr Creek, Brush Creek, and Clear Creek from the construction of a power transmission line from Big Salt Wash to the mine site.

Production Rate Alternatives (FI-50)

Surface water impacts on Clear Creek mesa due to a 50,000-bpd alternative would be the same as discussed in Section 4.4.1.2. Surface water impacts at the Fruita plant site would be the same as discussed above.

4.4.1.4 Alternative Siting Activities

Corridors

Impacts on water resources due to construction of alternative corridors would include soil erosion, sedimentation, stream flow disruption, and increased suspended solids in those streams that the corridors parallel or intersect. An accidental oil spill from the syncrude pipelines would pose water pollution problems to the drainages.

In addition, peak discharges of flood flow events would increase as a result of disturbance of vegetation cover and reduced runoff retention. Backwater effects, causing upstream flooding, would be possible due to railroad and access road corridors crossing streams. Those streams that would be affected by alternative corridors are presented in Table 4.4-3.

Reservoirs

Potential surface water impacts on Roan Creek for the alternative reservoir sites on Roan Creek (Lower Dry Fork, Upper Conn Creek, and Lower Conn Creek; Figure 4.4-1) would be similar to the proposed reservoir site described in Section 4.4.1.2. However, the alternative reservoir sites of Upper and Lower Conn Creek and Lower Dry Fork would inundate parts of Conn Creek and Dry Fork, respectively. Also, the upstream reservoir sites

would flood a longer stream segment of Roan Creek and potentially cause less damage to De Beque should a dam failure occur. Another water supply alternative is obtaining storage water from Reudi Reservoir. Surface water impacts of Reudi Reservoir will be analyzed in the EIS for Reudi Water Sale II, presently being conducted by the Bureau of Reclamation.

Spent Shale Disposal

Four alternative spent shale disposal sites have been evaluated for the Fruita II Project configuration. These four sites include: Garvey Canyon, Stove/Buniger canyons, Dry Gulch, and Munger Canyon. The Garvey and Stove/Buniger canyons alternative disposal sites are close to the proposed Big Salt Wash reservoir and within the Big Salt Wash drainage. Potential surface runoff and soil erosion from the spent shale pile may pollute the reservoir water and stream flows. The Dry Gulch site would have minimal surface water impacts due to the distance from the site to Big Salt Wash. The Munger Canyon disposal site, located in the Munger Creek drainage, may interrupt stream flow and degrade water quality in Munger Creek. In addition, water requirements for spent shale moistening would be higher in the Grand Valley because of a higher evaporation rate (resulting from higher air temperature) than at the Clear Creek mesa disposal site.

4.4.1.5 Transportation Alternatives

The alternatives for coal transportation include the use of trucks and rail transport. Both transportation alternatives would have a similar hydrologic impact of increased suspended sediment in streams from coal dust.

4.4.1.6 Solid and Hazardous Waste Disposal

Alternatives for waste disposal include on-site disposal and off-site disposal by a licensed contractor. There would be no project-specific surface water impacts due to off-site disposal. Impacts due to on-site disposal would include water quality impacts due to potential leaching and accidental spillage of hazardous wastewater from the disposal site. Surface runoff from the disposal site may also contain hazardous constituents.

Nonhazardous solid waste would be disposed in the spent shale disposal area. There would be no additional surface water impacts other than those described for spent shale disposal.

4.4.1.7 Secondary Impacts

Secondary impacts to surface water would result from increased population in the region. Secondary impacts would include increased water consumption, potential water contamination from wastewater and sanitary landfill, and increased suspended solids in streams due to increased activities adjacent to the streams.

4.4.2 Ground Water

4.4.2.1 General Impacts

The disruption of ground water movement and changes in ground water quantity and quality as a result of the CCSOP could result from (1) removal of portions of aquifers, (2) dewatering around the mined areas, (3) modification of ground water movement resulting from the backfilling of mining spoils or from abandoned underground workings, and (4) potential subsidence and fracturing of overlying rocks in the underground mine area.

Other local impacts ranging from minor to significant may also occur as a result of ancillary operations on or near the site, including spent shale disposal, water supply withdrawals, and other activities.

No significant regional impact on the ground water system would result from development of the proposed facilities on Clear Creek mesa or the alternative facility site in Grand Valley. Similarly, the proposed syncrude pipeline to Davis Point and the alternate route to Rangely would have no significant regional impact on the ground water system.

Local impacts would occur in the vicinity of No Name, Willow, and Clear creeks due to mining activities. Impacts would likely occur as a result of disruption of ground water movement, quantity, or availability, and changes to ground water quality.

Impacts discussed in the following sections are believed to be significant for the Proposed Action and alternatives to the Proposed Action.

4.4.2.2 Clear Creek Mesa and Associated Siting Activities

Mining Activities (PA-100, CC-100)

Aquifer Disruption. Underground mining would be limited to removal of the kerogen-rich Mahogany bed. Exploration adits driven into the wall of Clear Creek canyon to obtain bulk shale oil samples from the Mahogany bed did not experience significant inflows (approximately 1 gpm; Chevron 1982g, 1982w). Based on these data, underground mining operations themselves would not interfere significantly with the existing physical integrity of the A-Groove or B-Groove aquifers. However, underground mining would remove portions of the rock unit which separates these aquifers, thereby increasing the potential for inflows to the underground workings via interconnecting fractures. It is also possible that potential inflows to the underground workings would be greater in areas beneath or adjacent to saturated alluvial deposits in the valley bottoms (e.g., East Clear Creek), particularly where hydraulic communication between the alluvial aquifer and underground workings is facilitated by substantial fracture interconnections.

Surface mining would destroy the A-Groove and B-Groove bedrock aquifers by removal of these water-bearing strata within the mined area. The surface extent of removal would be approximately 8,400 acres over a period of 90 years. Table 4.4-5 summarizes the relationship of the affected area to the total area of the Clear Creek watershed and to the anticipated cumulative removal of all aquifers by the proposed shale oil mining operations.

In addition to disruption of the A- and B-Groove aquifers, surface mining would effectively remove the less extensive ground water bearing alluvial deposits in portions of West Willow, East Willow, No Name, and Mud Springs creeks. Based on the Operator's current plans, direct disturbance of the alluvial aquifer in the upper portions of Clear Creek would not occur.

Aquifer disruption would be a locally significant impact. Aquifers like the A-Groove and B-Groove, which typically have very low horizontal hydraulic conductivities, would probably exhibit areally limited drawdowns as a result of mine dewatering. As such, the aquifers would be impacted in the vicinity of the open pit mine, but the net effects should not extend away from the mine since water contained in storage is unable to move quickly through the aquifer to the seepage faces in the mine.

Those portions of the shale oil-bearing rocks and interlayered aquifers that are removed by surface mining would eventually be replaced by a single aquifer comprised of broken waste rock and backfilled spoil material. Underdrains consisting of local materials, probably Uinta Sandstone, would be placed below the overburden backfill to allow ground water to flow beneath the backfill after reclamation (Chevron 1982g). Unless compacted, the backfilled spoil materials should also be moderately permeable and the resulting porosity would likely be higher in the backfill materials than in the original aquifers.

The backfill placement of spoils would presumably be accomplished by a combination of truck and shovel, and conveyor belt techniques. Spoils placement utilizing these methods should allow for only moderate sorting due to gravity and undergo no appreciable compaction due to rubber-tired traffic. However, studies to specifically evaluate the resulting permeabilities of spoils placed by these methods are unknown. The anticipated backfill placement methods should yield permeabilities many times greater than that of the undisturbed aquifer and have at least as much capacity to store and transmit ground water as the original aquifers.

Unlike the waste rock spoils, spent shale and retorted materials placed in the mine pit would be isolated from the ground water system. As depicted in Figure 4.4-4, isolation of spent shale would be achieved by encapsulation

Table 4.4-5 MINE AREA/WATERSHED DISTURBANCE RELATIONSHIPS

Activity	Location	Acreage of Disturbance by Year					
		1983	1986	1991	1996	2008	2036
Aquifer disruption	Underground mine	0	0	0	0	0	0
Aquifer disruption	Surface mine	0	195	325	455	2080	2250
Cumulative area of aquifer removal	Underground and surface mine	0	195	520	975	3055	6305
Watershed area disturbance	Underground mine	15 ^a	2800 ^b	0	0	0	0
Watershed area disturbance	Surface mine	0	595 ^c	325	455	2080	3250
Cumulative area disturbed due to mining	Underground and surface mine	15	3310	3630	4085	6165	9410

Activity	Location	Percentage of Removal by Year					
		1983	1986	1991	1996	2008	2036
Mine area ^d	Underground and surface mine	0.12	25.46	29.92	31.42	47.42	72.38
Clear Creek ^e watershed	Underground and surface mine	0.02	4.38	4.81	5.41	8.16	12.46

^a Initial mine site.^b Clear Creek spent shale disposal area.^c Include Mesa facilities (400 acre) and a mine rate of 65 acre/year.^d 13,000 acres (includes all facilities).^e 75,520 acres of Clear Creek watershed.

within a highly compacted blanket of low permeability material near the top of the backfilled surface mine. Under current plans, it is assumed that the encapsulated zones of spent shale would be situated above the post-mining ground water potentiometric surface. The placement of an upper compacted shale layer with cover consisting of a capillary barrier, subsoil, and topsoil will limit the potential for infiltration of precipitation and snowmelt into the spent shale disposal cell.

Dewatering and Ground Water Flow. Mine water inflow pumped from both the surface and underground operations would create a local cone of drawdown (depression) in the ground water flow system around the mine. Dewatering at the mine would intersect ground water which is moving down gradient through the mined areas towards natural discharge points. Pre-mining ground water discharge points are located where the water-bearing units (the A- and B-Groove aquifers) are exposed in the adjacent canyon walls. It is likely that dewatering would lower ground water levels in the A- and B-Groove aquifers around the mines. Drawdown influence due to open pit operations to the east and south would probably be reduced considerably because the mined section and aquifers are exposed in the canyon walls in these directions.

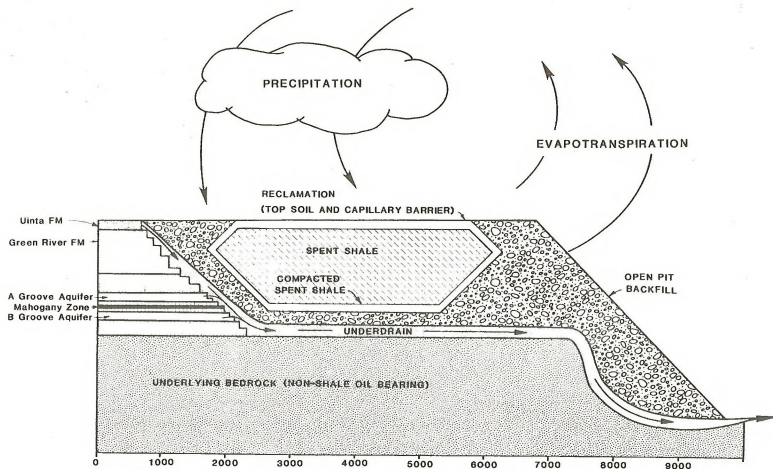


Figure 4.4-4 Conceptual Cross-Section Through Pit After Reclamation.

The actual magnitude of water level decline would be dependent on aquifer properties and discharge characteristics. The ground water inflow to the surface mine is estimated to be approximately 140 gpm (maximum) and should decrease to 50 gpm after 1 year (Chevron 1982g). Inflows to the surface mine would be higher initially as the hydrostatic pressure of the larger, regional fractures are drained. Mine inflows should then decrease more slowly as the pressure heads in the local joint system around the pit are reduced due to the dewatering effects. Water level declines in these aquifers would probably not be noticeable beyond a 1-mile radius of the active mine cut.

Three stock watering wells are present in the upland areas within a 2-mile radius of CCSOP property (Figure 3.4-6). Two of these wells (9 and 10) are completed in the Uinta Formation to depths of 83 feet and are located well beyond the future mine area to the northeast. The shallow completion depths for these two wells suggest that they would not be affected by mine dewatering and any declines in hydrostatic head in the deeper aquifers. One well (Well 8 on Figure 3.4-6) is located within the property boundary and is completed in the proposed mining zone. This well could experience water level declines because of its position within the mine's radius of influence.

Underground mining would have a limited impact on the local ground water system. Unlike surface mining, the underground mine should not, through removal of the Mahogany zone, severely disrupt the A-Groove and B-Groove aquifers.

Bedrock aquifer characteristics vary significantly on Clear Creek mesa due to the fracture-controlled nature of the permeability characteristics. As a result, it is estimated that inflows associated with underground mining would range from 100 to over 1,500 gpm based on assumed transmissivities, storage coefficients, and the mining method employed. Mine inflows encountered under stream canyon beds could, however, be greater than predicted if there is substantial hydraulic connection between the alluvial and bedrock ground water systems (Chevron 1982g). The dewatering associated with the proposed underground mining would have less effect on ground water levels in the A- and/or B-Groove aquifers than the proposed surface mining activities.

Modification of Ground Water Movements. Relatively impermeable shales of the Green River Formation interfinger with the overlying permeable sands of the Uinta Formation in the project area. This results in perched ground water conditions, which cause springs to emanate at the surface at selected locations. These conditions exist at the headwaters of Willow and No Name creeks, where springs discharge from the incised Uinta sandstone along the exposed contact between the Uinta and the Green River formations. Removal of these perched conditions would not occur as a result of the proposed mining activities. However, as the working face of the surface mine advances, these spring discharge locations would progressively shift to the north a maximum of 0.5 to 0.75 miles. The magnitude of these spring discharges should not be affected unless the areal extent and saturated thickness of these perched zones is naturally restricted.

At the completion of surface mining activities, underdrain materials would be placed against the Uinta/Green River contact within the mined area. These backfill materials would be highly permeable and have a high recharge capacity. Once the underdrain system is in place, the aforementioned springs would be covered with backfill materials and would discharge underground to the surface mine underdrain system. Due to a lack of information on the Uinta Formation ground water system at the site, it is not known whether this subsurface drainage would cause depletion of the perched ground water zones.

Impacts resulting from modification of flow by the replaced spoil materials on the shallow, perched ground water system as well as the deeper, bedrock ground water system should be local. The effects would be minor during the active surface mining period and would become locally significant only after completion of mining and reclamation. These impacts would continue over the long term as the underdrain becomes saturated and new springs occur either along the contact between the bedrock and spoils backfill, or somewhere on the face of the backfill, where permeability is high enough to direct flow laterally to the fill face. Changes in ground water flow resulting from underground mining activity would not represent a material impact on the local or the regional scale.

Effects of Subsidence From Underground Mining. Long-term subsidence effects following completion of underground mining may cause stresses in the overlying rocks, eventually resulting in fracturing and possibly collapse of overlying bedrock. Fractures that intersect the overlying A-Groove aquifer may allow ground water inflows to the underground workings of an unknown quantity and duration. The potential effects on the B-Groove aquifer may be an increase in recharge of mine waters to this underlying aquifer.

Water Quality Impacts. Two potential ground water quality impacts have been identified for the Clear Creek mining activities:

- Impacts due to ground water interaction with underdrain materials in the open pit mine
- Impacts due to ground water interaction with mine backfill (spoil) materials

The Operator has proposed construction of a subsurface drainage system at the base of the backfill material in the open pit mine (Chevron 1981a). This drain would be constructed with Uinta Formation geologic materials and is designed to collect inflows into the backfill material and transmit the ground water to surface diversions in the Willow Creek drainage. The chemical and physical nature of the Uinta Formation material is such that major water quality changes would not be likely. The presence of good quality ground water in saturated areas of the Uinta Formation (Murray 1974) is supportive of this contention. Some potential increases in total dissolved solids, calcium, and bicarbonate concentrations may result from the interaction of local ground water and the Uinta Formation drain materials.

Over very long periods of time, limited recharge may occur through the backfilled mine spoil materials via the infiltration and percolation of snowmelt, precipitation, and/or surface runoff. This recharging ground water may pick up additional ions in solution via the geochemical interaction with the spoil materials, resulting in higher TDS (total dissolved solids) concentrations. Depending on the amount of recharge moving through the backfill materials, some higher TDS ground water may reach the underdrain and (eventually) be discharged from the reclaimed mine area along with ground water flow transmitted from the A- and B-Groove aquifers.

Impact on Downstream Surface and Ground Water Interaction. In addition to those impacts directly attributable to mine dewatering, minor impacts to the interaction between surface and ground water could occur downstream along Clear Creek. Changes in this interaction could occur where (1) stream flow recharges the alluvial aquifer of Clear Creek canyon, and (2) where alluvial springs discharge, thereby contributing directly to stream flow. Recharge to both stream flow and the alluvial aquifer could be altered and perhaps decreased.

Impacts on Shallow Aquifers. Numerous seeps and springs have been documented as discharging small quantities of water from Clear Creek mesa (Chevron 1982g). These sources contribute to stream flow on the mesa, which in turn flows through waterfalls to Clear Creek. The springs originate near the contact between the Uinta Formation and the Parachute Creek Member of the Green River Formation. Additional springs have also been identified as discharging from alluvial deposits in the lower reaches of Clear Creek (Chevron 1982g).

Dewatering impacts directly associated with the mine should be negligible for the alluvial springs of lower Clear Creek. Significant impacts are likely for springs emanating from the mesa top area. Approximately eight of these upland springs are situated within the proposed surface mining area and, thus, their pre-mining points of discharge would be eliminated. Other springs adjacent to the mine site may cease to flow as a result of the dewatering of their source strata. As previously described, the cone of depression and resultant dewatering of shallow aquifers may remove the perched conditions occurring at or near the base of the Uinta Formation.

Plant Site and Ancillary Facilities

Surface runoff derived from the plant site and ancillary facilities would be collected in surface holding ponds. Infiltration of these waters into the subsurface is unlikely (Chevron 1982g), but unexpected infiltration could result in the contamination of ground water. Table 4.4-2 presents estimates of surface runoff water quality for major constituents. Comparing these values to ground water quality beneath the plant site (site CC-A, Table

3.4-5 of the DEIS) shows that calcium, potassium, and chloride concentrations are greater in the runoff water. Concentrations of chemical and oil and grease contamination were not estimated. It is assumed that any spills would be contained to the immediate source area and undergo immediate cleanup efforts.

Ground Water Withdrawals for Facility Water Supply

The Clear Creek alluvium well field system (Figure 4.4-5) would provide a portion of the water to the project from the start through the commercial first phase (roughly 5 years) and beyond if necessary (Chevron 1981a). Project requirements for ground water may taper off as surface water stored behind reservoirs (constructed during this early period) and surface water diverted directly is used. The well field could then be used as a supplemental water supply after completion of the reservoirs.

The proposed pumpage from the Clear Creek alluvial aquifer will modify the existing hydrologic balance of the system. Ground water withdrawals will intercept a portion of the alluvial aquifer underflow, steepen the existing hydraulic gradient and decrease the saturated thickness of the aquifer. The potential effect of these modifications will be a decrease in discharges from alluvial springs in the lower reaches of Clear Creek that contribute to stream flow. This potential flow decrease will be mitigated by implementation of a court-approved augmentation plan that protects senior downstream appropriations.

The decrease in alluvial water levels due to pumpage from the well field will be dependent on pumping rates and schedules, the special distribution of the wells, and the amount of recharge to the alluvial aquifer. Detailed studies of the Clear Creek alluvial aquifer (Chevron 1982w) indicate that a maximum sustained yield of 6,780 acre-feet (approximately 3,000 gpm) per year can be withdrawn from the well field without dewatering the production zone in each well, under existing recharge conditions. The field would be comprised of 21 production wells from the confluence of Willow and Clear Creeks to the confluence of Roan and Clear creeks (Figure 4.4-5). Spacing of these wells will determine the amount of drawdown due to pumpage. Wells within the radius of influence (effective drawdown area due to pumpage) of adjacent wells would result in cumulative drawdowns between each well. This cumulative drawdown effect could range from 7 to 20 feet of additional drawdown over that due strictly to pumping of individual wells. (Table 4.4-6).

Table 4.4-6 ESTIMATED DRAWDOWN, 200 FEET AWAY FROM SELECTED PRODUCTION WELLS
AFTER 5 YEARS OF CONTINUOUS PUMPING

Well Number	Transmissivity ^a (gpd/ft)	Storage Coefficient ^a (dimensionless)	Pumpage ^b (gpm)	Estimated ^c Drawdown at Radius = 200 ft (ft)	Location
CC-ALL-17	98,000	0.02	400	5.2	Mouth of Cottonwood Creek
CC-ALL-6	307,000	0.10	1,000	4.0	Between Deer Park and Scott Gulch
CC-ALL-19	264,000	0.05	1,500	7.3	Between Deer Park and Scott Gulch

^a Source: Chevron (1982w).

^b Source: Chevron (1982g).

^c Calculated using Theis (1935) non-equilibrium formula

Alluvial pumping test data for the Clear Creek alluvium indicates that wells upstream of alluvial springs near Tom Creek will not induce additional recharge from the adjacent stream channel. This is due to the limitation on recharge imposed by channel bottom permeability as suggested by the observed water table depth which is significantly below the channel bottom at locations upstream of Tom Gulch (Chevron 1982w). This suggests that surface flows in Clear Creek upstream of Tom Gulch will not be affected by the alluvial well field pumpage. The flows in Clear Creek below Tom Gulch will be diminished due to the decrease in alluvial spring discharge that will result from pumping in the alluvium. As in the Roan Creek valley, portions of Clear Creek from Tom Gulch to the confluence of Roan Creek exhibit direct connection between surface and ground water, thus any drawdowns induced in this area will ultimately decrease alluvial spring discharges or induce additional channel infiltration (Chevron 1981a).

Direct impacts on the alluvium of lower Clear Creek canyon could potentially result from the extraction of large volumes of water in the upper and middle valley. The proposed pumpage may decrease the surface and subsurface flows in the Clear Creek system and thus decrease the flow contribution to the Roan Creek system. These potential impacts will not be significant since under state water rights law, a plan of augmentation that will protect senior downstream water rights must be approved by the court, and implemented by CCSOP. This augmentation plan will be designed to protect senior water rights during their period of use at their withdrawal point; thus, a physical decrease in flow in Clear and Roan creeks could occur during portions of the year when senior appropriators are not diverting water.

Corridor Impacts

The Roan Creek corridor is not likely to impact ground water except during construction. Ground water could incur minor temporary impacts during construction due to infiltration of higher TDS surface runoff from disturbed areas.

Aquifer disruption or ground water degradation along the La Sal syncrude pipeline corridor is unlikely. Ground water along the route is limited to recharge from infiltration of precipitation into the sandy soils and underlying Uinta Formation (Chevron 1982g).

Impact to the ground water resources of Big Salt Wash due to the construction of the water pipeline corridor would be minor. The potential for surficial disturbances to influence the water quality or quantity of the bedrock aquifers is unlikely. However, the infiltration of higher TDS surface runoff from disturbed areas is possible, although this potential impact would be minor and short-term.

Reservoir Impacts

The Roan Creek and Big Salt Wash drainages contain large quantities of useable ground water. The quality of the ground water is adequate for irrigation and stock watering uses. High TDS values and bacterial counts eliminate its safe use for domestic purposes (Chevron 1982h). Alluvial ground water quality should exhibit similar quality characteristics to surface water because of the interrelationship of these relatively small drainages.

Surface water quality data indicate that the Colorado River is generally of much higher quality than Roan Creek. Storage of water from the Colorado River in any of the proposed reservoirs along the lower Roan Creek drainage should positively affect the existing ground water quality. Assuming no severe upstream impacts, changes in the ground water quality could include decreased concentrations of bacteria, dissolved solids, and sulfates.

Surface Water Diversion Points (De Beque and Fruita)

No long-term impact is expected to occur to the ground water system at the De Beque and Fruita diversion points. Short-term impacts could occur locally during the construction phase due to fuel spillages.

Nonprocessed Shale and Spent Shale Storage and Disposal

Leachate generation from the nonprocessed shale storage piles would be minimal due to the constant use of nonprocessed shale for retorting. With proper surface runoff control, the constant addition and removal of these materials from storage piles should help reduce the potential for saturation from infiltration of surface runoff or precipitation. Further, the stored materials must first reach field capacity before leachate seepage can be generated. As a result, the potential for ground water contamination in the vicinity of these temporary storage piles is slight.

The disposal of spent shale and solid wastes in the Clear Creek drainage could potentially be a significant source of leachate or seepage. The actual amount of leachate generated (if any) by the proposed disposal system would depend on water balance conditions in the pile, solute release and interaction with pore waters, and transport of water and reacting and nonreacting solutes in an unsaturated flow system.

Significant leachate generation at the spent shale disposal site is unlikely due to the design of the proposed disposal at the Clear Creek mine site (Section 2.3). The disposal site final topography will be designed to minimize ponding of water and thus reduce infiltration of surface water. The soil layers and the capillary barrier (Figures 2.3-12 and 4.4-4 of the DEIS) overlying the highly compacted spent shale top liner (permeability = 1.4×10^{-4} feet/day) would prevent direct infiltration of water into the disposal cells (Chevron 1982cc). The soil layer will maintain the majority of infiltrating moisture where it can be utilized by plant species revegetating the disposal area. Influx of ground water into the disposal cells at the Clear Creek surface site through the bottom liner would be unlikely due to the lowering of ground water levels beneath the disposal site caused by underground mining and the impermeable nature of the shale bottom liner. Ground water influx into the open-pit disposal cell is not likely because anticipated ground water levels would be below the bottom of the disposal cell.

Two possible sources of water influx to the disposal cells include (1) water infiltrating during the construction of the disposal cell and prior to completion of the compacted shale top liner and (2) possible long-term weathering effects on the top and/or bottom liners that may result in leaks in these liners. If leachate did occur in the disposal cells, the relatively impermeable nature of the spent shale would retard migration of leachate within the cells.

In order for any contamination of ground water resources to take place, sufficient water would have to infiltrate into the spent shale disposal cell to result in a zone of saturation above the lower liner. This would require sufficient infiltration to raise the bulk of the disposal cell above field moisture capacity before development of the saturation zone at the lower boundary. The probability of generating any leachate is low since infiltration of small quantities of excess moisture is controlled by the upper compacted shale layer. Major seepage of moisture into the disposal cell would occur only if the liner was breached by a slope failure, major differential subsidence beneath the disposal cell, or gully development on the disposal area. Slope stability analyses were conducted during conceptual design of the disposal cells (Chevron 1982ff) and the factor of safety under design earthquake loads meets standard engineering design criteria. An analysis of subsidence potential was conducted and an areal sag of only about 6-12 inches may occur due to leaving of sufficient pillars within the mine workings to support the roof; (Chevron 1982ff). The surface drainage on the disposal area will be controlled to avoid the possibility of gully development that could break the upper liner. The probability of liner failure and subsequent degradation of ground water is low due to the design features of the proposed disposal method.

Potential leaks of leachate from the open-pit disposal cells would migrate to the underdrain at the base of the backfilled mine. Once the leachate reached the underdrain it would be diluted by ground water flowing through the drain, discharged into Willow Creek, and flow into the sedimentation pond at the confluence of Willow and Clear creeks. If this series of events were to occur, it is likely that the concentrations of elements in the sedimentation pond would be unaffected due to dilution of the leachate by surface and ground waters.

If leachate migrated beneath the proposed Mesa Valley Fill spent shale disposal site, it could reach the underlying upper Parachute Creek aquifer by two mechanisms: (1) porous flow and (2) fracture controlled conduit flow. Leachate migration through the unsaturated portions of the upper Parachute Creek Member would be very slow

due to the low permeability of the material (hydraulic conductivity range of 0.07 to 85.80 feet/day). After the leachate migrated to the upper Parachute Creek aquifer, low ground water flow velocities (ranging from 1.1×10^{-3} to 8.9×10^{-7} feet/day) would transport the leachate to the aquifer discharge area in the canyon walls of Clear Creek. Given this range of flow velocities, it could take approximately 250 to 310,000 years for the contaminant to migrate 100 feet within the aquifer.

If leachate encountered an open fracture system in the bedrock unit beneath the disposal site, the fracture system could transmit the leachate as conduit flow to the aquifer below. Fracture conduit migration would be much faster than migration through the porous matrix of the bedrock unit. However, it is impossible to estimate leachate migration through conduit flow due to the variable nature and occurrence of fracture systems at the site.

The mineralogic composition of STB spent shale is presented in Table 2.3-6 of the DEIS. The results of leach testing conducted on spent shale samples from the CCSOP process test are presented in Table 4.4-7. The concentration of total dissolved solids from the initial pore volume(s) (pore volume 1; 10,900 mg/l) is much greater than for subsequent pore volumes (pore volume 3; 4,120 mg/l). The high concentration observed in pore volume 1 is probably due to the initial rinsing of very soluble salts from the spent shale during leaching by the first pore volume of the test (Chappele 1980). Pore volume 1 therefore probably represents a worst-case impact due to the rinsing of soluble salts. Sample pore volume 3 is potentially more representative of leachate generated over long periods at the disposal site.

Comparison of Table 3.4-5 of the DEIS, and the results of the aforementioned leach testing to baseline bedrock (CCA) and alluvial (CC-All 12) ground water quality yields several conclusions. The A-Groove aquifer (CCA) and the alluvial aquifer (CC-All 12) have been identified as possible recipients of small volumes of spent shale leachate. Examination of total dissolved solids (TDS) for leach test water (pore volume 3) indicates that concentration of TDS (4,120 mg/l) in the leachate water is more than 7 times the TDS concentration of baseline ground waters (550 mg/l). Should the liner fail, the concentrations of sulfate, cyanide, ammonia, and calcium could increase in the ground water due to leachate contamination. Hardness and pH may also increase. Regionally, salts (sodium, calcium, sulfate, and chloride), monovalent cations (potassium and lithium), reduced sulfur, mobil trace ions, (boron, fluoride, and molybdenum), and organic compounds have been identified as potential contaminants in leachate generated by spent shale disposal (Ferrard and Nazaryk 1982).

Alternative Production Rates (PA-50, CC-50)

Ground water impacts due to a 50,000-bpd production rate with an all underground mine include aquifer disruption, ground water withdrawal due to mine inflows, and ground water quality degradation. This alternative would result in less impacts to the ground water system than the combined underground/open pit mine plan (PA-100) due to the lack of aquifer destruction resulting from an open pit mine. The increased area of the underground mine would result in greater mine inflows and potentially more contamination due to the underground mining operation. Again, these cumulative impacts would still be less than the underground/open pit mining alternative. Spent shale disposal, ancillary facilities, and water supply needs are assumed to be the same as for the 100,000-bpd alternative and are addressed in previous sections.

4.4.2.3 Grand Valley and Associated Siting Activities

FI-100, FII-50, and FI-50 Facility Sites

Based on limited data, impact to the regional ground water regime due to an alternate upgrade and/or retort facility in the Grand Valley would be unlikely. Locally, the ground water resources may be negatively impacted by spills or leaks originating at the upgrading facility. These ground water resources include shallow ground water contained in the Mancos Shale (which underlies the site) or ground water contained in the alluvial deposits of Big Salt Wash, 1 mile east of the facility.

Table 4.4-7 SPENT SHALE LEACH TEST RESULTS COMPARED TO BEDROCK AND ALLUVIAL WATER QUALITY

	Run 45 A ^a	Run 45 B ^b	Mean CCA	Mean CC-ALL 12
Sulfur Species				
H ₂ S (Hydrogen Sulfide)	3.5	1.1	NA	NA
Thiol	30	4.2	NA	NA
Sulfate	3,250	1,133	85	130
Thiosulfate	140	21	NA	NA
CN (Cyanide)	1	4.5	ND ^c	ND
Nitrogen				
NH ₃ (Nitrate)	415	37	ND	0.585
Metals				
Antimony	0.03	0.03	ND	ND
Arsenic	0.03	0.01	ND	ND
Barium	0.2	0.3	0.1	0.1
Beryllium	0.01	0.01	ND	ND
Boron	3.2	1.9	.3	0.5
Cadmium	0.03	0.03	ND	ND
Chromium	0.02	0.02	ND	ND
Copper	0.05	0.03	ND	ND
Iron	0.1	0.1	.06	0.04
Lead	0.12	0.05	ND	ND
Mercury	1 ppb	1 ppb	ND	ND
Nickel	0.08	0.04	ND	ND
Potassium	NA	NA	2.0	4.0
Sodium	1,700	84	160	92
Selenium	0.03	0.02	ND	ND
Silver	0.02	0.01	ND	ND
Thallium	0.1	0.1	ND	ND
Zinc	0.14	0.01	.4	.03
General Water Quality				
BOD (Biochemical Oxygen demand)	500.	80	ND	ND
COD (Chemical Oxygen demand)	1,100	120	16	11
TDS (Total dissolved solids)	10,900	4,120	550	550
TSS (Total suspended solids)	14	15	NA	NA
O and G (oil and grasses)	12	12	ND	ND
Chloride	17	5.5	6	1.0
Calcium/as CaCO ₃	85/212	180/450	25/57	53/132
Magnesium/as MgCO ₃	0.06/0.24	0.12/0.48	21/NA	41/NA
Hardness	212	450	154	248
CO ₂ (Carbon dioxide)	26	6	NA	NA
pH	10.9	10.8	7.5	7.88
Organics				
TOC (Total organic carbon)	660	230	18	16
Phenol	18		0.01	ND

^a A = First 1280 ml collected (1 pore volume)

^b B = Third 1280 ml

^c ND = Not detected, below detection limits

16 Road Corridor

The 16 Road corridor (Fruita to upgrade) for railroads, access road, natural gas and water supply pipelines, and a transmission line are underlain by the Mancos Shale. The potential for migration of contaminants (due to leaks or spills) into deeper regional aquifers is considered low. Disruption of ground water movement or water quality degradation is very unlikely.

Raw and/or Spent Shale Transfer System

Utilizing data available for adjacent areas, it appears that changes in ground water could occur during construction of the Straight Line/Tunnel Route. The impacts to ground water quality would be short-term and would probably consist of increased TDS concentrations and slight degradation due to introduction of bedrock ground water to the alluvial ground water system as tunneling operations occur through water-bearing rocks. Disruption of ground water flow or spring discharging characteristics is not considered likely because of the small tunnel diameter when compared to the total hillside area and the short term over which construction would occur.

4.4.2.4 Alternative Siting Activities

Rangely Corridors

No significant impact would likely occur to the ground water resources along the corridors. The lower end of Rangely A lies in the Douglas Creek drainage. The placement of the pipeline in this drainage would affect the alluvial ground water system in a manner similar to those corridors which include Roan and Clear creeks. Some minor, short-term impact to the shallow, alluvial ground water resources could occur during the construction phase if higher TDS surface runoff from disturbed areas infiltrates the alluvial aquifer. This impact would diminish with time. Potential impacts to alluvial aquifer water quality could occur if a pipeline rupture results in a major spill in an area underlain by alluvium. No impact would be expected to occur to water-bearing bedrock units.

Spent Shale Disposal

Ground water impacts at the Mesa Valley Fill spent shale disposal site include disruption of the existing Clear Creek alluvial aquifer system, potential ground water quality degradation due to leachate, and spring discharge/recharge removal. Impacts discussed in Section 4.4.2.2 are valid for Clear Creek disposal alternatives. Impacts of Stove/Buniger canyons and nearby sites (FII-50 configuration only) are minimal since there are no existing alluvial aquifers in the canyons. Potential leachate may enter into the Big Salt Wash alluvial system and degrade water quality.

4.4.2.5 Transportation Alternatives

The transportation alternatives are not expected to affect ground water resources.

4.4.2.6 Solid and Hazardous Waste Disposal

Two methods of waste disposal are proposed for this project: (1) disposal with the spent shale in the appropriate disposal area, and (2) disposal in a landfill adjacent to the spent shale disposal area on upper Clear Creek. The waste material may be 2-4 percent of the volume of the spent shale material (Ferrow and Razarzk 1982). Potential impacts due to leachate generated by waste disposal would migrate as spent shale leachate described in earlier sections. Assuming disposal practices and site design would prevent leachate generation under natural conditions, adverse impacts are expected to be minor for the solid and hazardous waste disposal site.

4.4.2.7 Secondary Impacts

Secondary impacts due to population growth may have a minor effect on ground water resources in selected areas. The quantity of ground water in these areas may decrease due to the growth of demand for domestic and support industry water supplies. Water quality may be impacted in areas of landfill disposal of solid and hazardous wastes, as generated by the growth of domestic and support industries. Overall, the effect of population increase on the ground water resource may be isolated to areas of extreme increases.

4.7 Aquatic Ecology

4.7.1 General Impacts

Impacts to aquatic ecosystems would occur during construction and operation phases of the CCSOP. Project construction activities would eliminate and/or degrade some small stream habitat by physically covering areas with various project features or by altering existing channel configurations. Construction would also expose soils in affected watersheds to surface erosion and could increase sediment and silt loading to streams. Specific amounts of sediment entering the streams would depend on the proximity of streams to construction, the frequency and magnitude of storm/runoff events, and the kinds of sediment abatement practices employed during construction activities. Significance of the impacts is dependent on the value of the aquatic biota inhabiting the water bodies and the amount of habitat affected.

Impacts resulting from operations are primarily those caused by the water supply system (including the GCC water system), the surface water control system, and corridors. The water supply system would impact organisms in the Colorado River at intake locations due to direct losses from entrainment, and would affect instream flows (and therefore habitat) for aquatic organisms from De Beque to Lake Powell. Small streams would be affected by habitat loss due to flow depletion caused by pumping of alluvial wells and low or no discharge from surface water control systems. Potential impacts from use of corridors may result from sediment and dust suppression chemicals contained in runoff from unpaved roads; deicing and other chemical treatments contained in runoff from paved roads; materials spilled as a result of vehicle (truck or railroad) accidents, or pipeline breaks; windborne losses from trucks and railroad cars; and surface disturbance caused by repair and maintenance of the corridor. The potential for impacts resulting from these activities increases with the proximity of the corridor to surface water, the length of the corridor, the amount of use the corridor receives, and the sensitivity (importance) of potentially impacted water bodies.

During construction and operation phases, the potential exists for significant secondary impacts. These would likely result from increases in fishing pressure, and increases in point and nonpoint sources of pollution resulting from project-induced population increases.

Each of the general types of impacts, as they apply to the various project alternatives, are discussed in the following sections. The Colorado River is considered from De Beque to Lake Powell.

4.7.2 Clear Creek Mesa and Associated Siting Activities

Proposed Action (PA-100)

Mine and Plant Site. The major impact of the mine and plant sites would be the dewatering and habitat alteration of about 25 miles of stream habitat in the Clear Creek drainage due to the mine and water control dams and reservoirs (see Figures 2.3-1 and 4.4-2). These reservoirs are designed to control water drainage through the mine and plant sites, as well as retain all water. Therefore, portions of the East and West Forks of Willow Creek, and all of Willow and Clear creeks would be lost as habitats that support fish and other aquatic life. The most significant loss would be the upper portion of the Clear Creek system (approximately 15 miles of stream, including all of the Willow Creek system) that contain rainbow trout; it would either be eliminated by the mine or dewatered.

The lower 10 miles of Clear Creek would be subject to additional flow reductions over those presently occurring because of irrigation diversions, further limiting its potential as a viable aquatic ecosystem. These flow reductions would also reduce the flows in Roan Creek below the mouth of Clear Creek. However, since these latter two areas are marginal habitat at present, this would not be a significant impact.

No threatened or endangered fish species have been documented from the upper Clear Creek system; therefore, no impacts to threatened and endangered species would occur due to construction of the mine or plant.

Corridors. The La Sal pipeline corridor (Clear Creek mesa east to Davis Point) would cross the headwaters of two streams with trout populations: Willow Creek in the White River system and West Fork Parachute Creek. Impacts would result from sedimentation during construction and from the loss of habitat at the stream crossing point due to removal of riparian vegetation and channel alteration. These impacts would be nearly eliminated with proper construction techniques, which should include only limited removal of riparian vegetation.

Pipeline breakage could also cause impacts to the streams. Syncrude, if it gained access to these streams, would probably eliminate all fish and most aquatic insects from the affected portion of the streams. Since the pipeline is many stream miles from either the White or Colorado rivers and cleanup should occur before it reaches these rivers, significant impacts are not anticipated from pipeline breaks.

A power transmission line is also proposed for the La Sal corridor. Impacts to Willow Creek and West Fork Parachute Creek due to construction of the line could include minor sedimentation, but would not be significant.

A multiple use corridor is proposed for the Roan Creek and Clear Creek valleys to contain a water pipeline, a road, and a transmission line. This corridor would have little additional impact to the Clear Creek-Roan Creek system over that caused by the mine and plant site. Additional sedimentation may occur, but would be limited to stream portions that do not have a viable aquatic ecosystem.

A corridor between the Loma water intake system and the Clear Creek Mesa would contain a water pipeline and a road. During construction, sedimentation of Big Salt Wash, Grand Valley Canal, Government Highline Canal, and West Douglas Creek could occur but would be minimized by proper construction techniques. Effects to reservoirs in the Loma area would also be minimal, and would be caused primarily by increased turbidity from the inflow of streams crossed by the corridor. Some increased sedimentation may also reach the Colorado River, but since all the canals and streams are presently quite turbid, no significant impacts are anticipated.

The headwaters of Willow Creek, which contain Colorado River cutthroat trout (a state-listed species), would be crossed by the La Sal pipeline. Construction impacts of sedimentation and loss of habitat would occur, but could be mitigated by proper construction techniques. An oil spill due to a construction accident or pipeline failure could eliminate Colorado River cutthroat trout from Willow Creek. However, pipeline failure rates are extremely low: about 1.5 accidents per mile per 100 years (Woodward-Clyde 1983). Since the life of the CCSOP is estimated at 100 years, a pipeline failure that could adversely affect the Colorado River cutthroat population in Willow Creek would be expected at least once in a statistical sense during the life of the project. The severity of the impact would depend on the amount of oil spilled and the timing of cleanup operations.

Endangered fishes in the Colorado or White rivers could be affected by a syncrude pipeline failure, but cleanup efforts should be initiated before the crude oil reaches these major rivers. No impacts to endangered fish in the Loma area are expected due to construction and use of the proposed corridor.

Reservoirs. A reservoir on Roan Creek is proposed that would have a maximum capacity of 175,000 acre feet. The reservoir is planned for staged development, initially sized only for the CCSOP requirements of 30,000-70,000 acre feet. Four alternative locations for the dam have been proposed; each is on lower Roan Creek and would flood about 6-8 miles of Roan Creek and the lower portion of several tributary streams. Since this portion of Roan Creek presently has only a limited aquatic ecosystem due to intermittent flow, and since the affected portions of the tributaries also do not contain significant aquatic habitat, no significant adverse impacts due to loss of stream habitat are expected from any of the alternative dam sites.

Increased concentrations of suspended solids would occur in Roan Creek and the Colorado River during construction of the Roan Creek dam, especially after heavy rains or during spring snowmelt. However, high concentrations of suspended solids are presently found in both of these streams following precipitation events. Although an incremental increase in sediment would be expected, it would probably not noticeably affect the fish or benthic macroinvertebrates of the Colorado River or Roan Creek.

No discharges, except those required to meet downstream water rights, are planned from Roan Creek reservoir. This would probably be a very slight benefit to aquatic organisms in the Colorado River, but would probably not be measureable and therefore not significant. The reservoir would serve as a sediment trap for Roan Creek, decreasing the amount of sediment flowing into the Colorado River (especially during spring runoff).

The proposed Big Salt Wash Reservoir would inundate a portion of Big Salt Wash that presently contains limited aquatic resources. The reservoir would probably provide habitat for a variety of native and introduced non-game fishes (and perhaps some warm water game fish) that would gain access through Big Salt Wash. Therefore, no significant aquatic habitat would be lost and the reservoir would represent a slight gain in habitat. Sedimentation from construction of the dam may reach the Colorado River, but proper construction techniques would eliminate any significant problems.

Increased sediment in the Colorado River due to the construction of either the Roan Creek or Big Salt Wash reservoirs is possible, thus potentially affecting endangered species by affecting habitat during times when natural sediment in the river is low. Proper construction techniques should mitigate this potential impact.

Water Supply Systems. The discussion of water system impacts in this and following sections involves primarily the impacts to federal threatened and endangered species, as provided by an analysis of four scenarios:

- CCSOP depletions of the Colorado River (Table 4.7-1), according to operations plans (Chevron 1983a)
- CCSOP depletions of the Colorado River based on the maximum water rights of Chevron and Conoco at De Beque (268.75 cfs)
- Total GCC (CCSOP, Getty, and Cities Service) depletions of the Colorado River according to the operations plans (Table 4.7-2) of the three participants (Chevron 1983a; Getty 1983; Cities Service 1983)
- Total GCC depletion to the Colorado River based on the maximum water rights (442.25 cfs) of all three participants at De Beque

CCSOP withdrawals at Loma are included in alternative discussions that involve this option, including depletions based on operations plans and water rights at Loma (125 cfs). In addition to these scenarios, the initial filling of the Roan Creek reservoir (175,000 acre feet) and Salt Wash reservoir (12,000 acre feet) would cause additional depletion. The timing of reservoir filling will be determined by the Colorado State Engineer, and is usually stepped to allow for dam safety checks. Therefore, no accurate schedule of filling is known and it has been assumed in the following discussion that the reservoirs are full. It is probable the reservoir will be filled prior to actual need for the water by the CCSOP, and therefore withdrawal rates may be within the range analyzed here for full-scale production.

The water supply system proposed for the CCSOP involves the use of alluvial and bedrock wells within the Clear Creek property, the use of Clear Creek mesa surface water, and water diverted from the three locations on the Colorado River: (1) near De Beque, (2) at Finley Ranch pumping plant just below De Beque, and (3) near Loma (see Figure 4.4-1 in the Surface Water section of the FEIS). The wells on and near the Clear Creek property would add to the impact of the mine and water control system on Clear and Roan creeks. These wells would reduce flows from springs and seeps (as well as those flows in the stream directly affected by alluvial pumping), thereby reducing downstream flows in Clear Creek even further. As noted above, the loss of the upper Clear Creek system streams is a significant adverse impact, but the degradation of lower Clear Creek and Roan Creek are not considered significant impacts because of the poor habitat quality presently existing in these areas.

The construction of the intake structures at De Beque and Loma would cause temporary increases of suspended sediment in the Colorado River for a few miles below the construction site, and would also disturb a relatively small area of the river bed. These habitat alterations may affect some of the nongame native species by disturbing spawning or feeding areas, but no significant loss of habitat or fish is expected. The Finley Ranch pumping station is an existing unit so only minor construction would be required.

Table 4.7-1 PROPOSED AVERAGE DAILY DEPLETION (CFS) FOR THE CCSOP ON THE COLORADO RIVER

Water Year	Month											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
1962	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1963	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	17.3	15.7	14.8
1964	81.1	23.3	23.0	8.0	7.8	9.5	70.5	27.1	34.5	36.7	33.9	31.7
1965	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1966	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	16.1	14.8
1967	61.3	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1968	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1969	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1970	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1971	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1972	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	15.3	51.0
1973	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1974	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	13.9
1975	44.4	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1976	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1977	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	16.7	15.4	13.6
1978	83.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	27.0	14.5
1979	50.8	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	31.7
1980	27.1	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	33.9	16.3
1981	42.0	23.3	23.0	21.7	22.3	24.4	27.5	27.1	34.5	36.7	15.6	14.1

Source: Chevron (1983a).

Operation of the intake structures could cause two major types of impacts: (1) entrainment losses of fish and macroinvertebrates that are withdrawn by pumps, and (2) habitat alteration due to flow depletion in the Colorado River.

The De Beque intake is a conventional design utilizing a streamside series of pumps to withdraw water directly from the river. The structure would be built to withdraw a maximum of 422.25 cfs, which is the total water right of the three GCC participants. No screening or other methods of reducing the entrainment of fish or macroinvertebrates have been included in the design, and intake velocities of about 2 fps are planned. A weir to maintain water level has been deleted from the design (Franko 1983).

The EPA (1976b) has recommended that intake velocities remain below 0.5 fps to reduce entrainment losses. Therefore, based on intake velocity, the De Beque intake would entrain fish and perhaps other aquatic organisms that utilize this portion of the Colorado River.

A major concern of intake structures in many rivers is drifting larval fish. Since these very small fish cannot move against the current, they are very susceptible to being entrained. Larval fish studies to date in the Colorado River have not shown any major pelagic, or open water drift, and most larvae are collected in quiet waters along shore (Wick et al. 1981). Holden and Wick (1982) reported on a major invertebrate drift study in the 1960's in the Green River that caught very few larval fish. Holden et al. (1980) sampled drifting macroinvertebrates in the San Juan River and found very few larval fish. Lamarra et al. (1983) noted larval drift emanating from a cobble bar on the Yampa River, but no drifting larvae above the bar. Miller et al. (1983) placed drift nets in the Green River specifically for catching larval fish and caught relatively low numbers. Haynes et al. (1983) completed the most intensive larval fish drift study to date, in the Yampa and Colorado rivers in 1982. Catch rates of larval fish were very low, ranging from 0 to 49 fish per 1,000 square meters of water. Therefore, it appears that larvae of most fish in the Colorado River probably drift from the spawning site downstream until they reach suitable habitat

(backwaters or other slow areas along shore) and that no general downstream drift of larval fish occurs. Collections of young fish in the area near De Beque suggest that the common species (flannemouth and bluehead suckers, roundtail chub, speckled dace) do not drift as far as larvae because juveniles are common in all river sections (Valdez et al. 1982). Therefore, larval fish would be common in the intake area since it is along a shoreline, and some larvae would be entrained. However, no major downstream drift of larvae probably occurs, thus keeping entrainment losses of larvae to a relatively small portion of the river. Larvae of the various fish species are found from late May to September (Valdez et al. 1982); therefore, entrainment could occur throughout this time period.

Juvenile fish of most native species found near De Beque generally concentrate in backwaters, eddies, and other slower current habitats along shore (Holden and Stalnaker 1975; Valdez et al. 1982). The proposed intake structure would probably create such a habitat, either at the mouth of the water inlet area or within the intake structure itself. Slow water habitats, particularly backwaters, are relatively rare in the river near De Beque (Valdez et al. 1982), suggesting that creation of such a habitat would probably concentrate juvenile fish as well as larvae, and consequently increase the potential for entrainment. The juveniles, unlike larvae, would continue to move into this area and be pumped out of the river. Therefore, entrainment of fish, especially juveniles of the common native species near De Beque, would occur and relatively large numbers could be removed from the river. The number of fish entrained would increase directly with increased water withdrawal rates and concentration of fish at the intake. Therefore, more impact would occur as Getty and Cities initiated pumping, or when the total CCSOP or GCC water right was withdrawn. Young fish would be most abundant in the area in mid-summer or late fall (soon after spawning), but would concentrate in this area year-round.

Table 4.7-2 PROPOSED TOTAL GCC (CHEVRON, GETTY, CITIES) AVERAGE DAILY DEPLETION (CFS) ON THE COLORADO RIVER UNDER THE CCSOP PROPOSED ACTION ALTERNATIVE (NEGATIVE VALUES DENOTE PERIODS OF AUGMENTATION TO THE RIVER DUE TO MUNICIPAL RETURN FLOWS)

Water Year	Month											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
1962	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.3	96.2
1963	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	87.5	84.2	79.3
1964	143.6	85.6	85.6	54.1	53.3	95.3	142.9	94.3	102.5	106.9	102.4	96.2
1965	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1966	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	84.6	79.3
1967	123.8	89.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1968	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1969	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1970	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1971	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1972	89.6	85.6	89.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1973	89.5	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1974	106.8	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	78.4
1975	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1976	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	96.2
1977	89.6	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	49.7	-5.6	-4.8
1978	195.6	140.5	124.3	123.8	114.8	86.1	90.6	94.3	102.5	106.9	95.5	-3.9
1979	76.5	108.1	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	74.9
1980	110.2	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	102.4	54.4
1981	130.0	85.6	85.6	85.1	85.2	86.1	90.6	94.3	102.5	106.9	-5.4	52.2

Source: Chevron (1983a); Getty (1983); Cities Service (1983).

Table 4.7-1 shows the estimated average daily depletions by month that will be withdrawn from the Colorado River based on a 100,000-bpd project, based on the period of record 1962-1981, including domestic uses. These flows reflect nearly continuous pumping and show a maximum average daily depletion of 75.1 cfs in October 1977 (water year 1978), but a normal depletion of about 20 cfs. Table 4.7-1 shows the average daily depletion, by month, of all three GCC participants at De Beque, also assuming continuous pumping. Maximum withdrawal is 195.6 cfs in October 1977 (water year 1978), and the normal pumping rate is about 85 cfs.

The CCSOP operations would, therefore, normally entrain an unknown number of larvae and juvenile fish with depletion of about 20 cfs. At full water rights (withdrawals of 268.75 cfs), the number of young fish entrained could increase by about 13-fold, assuming a direct relationship between the amount of water withdrawn and the amount of entrainment. Normal operational withdrawals of the GCC (about 85 cfs) could entrain about four times the amount of the CCSOP operations plans. The GCC water rights (442.25 cfs) could entrain 1.6 times the CCSOP water rights (268.75 cfs). Due to the junior status of CCSOP and GCC water rights, the total amount could only be withdrawn in April-June of most normal or dry years, therefore reducing the impact of the water rights scenario for these two months.

Since it is not possible to quantify the amount of entrainment, a worst-case analysis shows that significant entrainment of young fish would occur at all withdrawal scenarios, but is most severe in the GCC and two water rights scenarios. The entrainment loss of fish at De Beque could alter the fish community structure of the river by decreasing numbers of native species, and thereby providing increased habitat and less competition for introduced species (which are presently not very common near De Beque). This change in the aquatic community would be a significant adverse impact.

The Finley Ranch pumping plant is a historic irrigation system that pumps water from a small side channel through a poorly screened pipe. It appears probable that entrainment of young fish has occurred historically and that additional entrainment would occur if the CCSOP diverts more water than has historically been pumped. These entrainment losses would add to those described above for the De Beque site although, by themselves, the Finley Ranch entrainment losses would probably not be significant.

Since completion of the DEIS, the CCSOP has committed to the use of one of three passive intake designs at the Loma site. These designs are: (1) a passive screen, (2) an infiltration gallery system similar to a "Ranny" system, or (3) a porous dike system. These designs would limit intake velocities to 0.5 cfs (Chevron 1983b). Entrainment at the Loma structure would, as a result, not be significant since the proposed designs include passive systems to protect against withdrawing fish and other aquatic organisms.

Alteration of flow levels in the Colorado River near De Beque, as well as those below Loma, would occur due to the depletion in flow caused by either or both intakes. Tables 4.7-1 and 4.7-2 show these depletions for the CCSOP and GCC on the Colorado River. Both levels of depletion would cause lower flows year-round. Reduced flows may alter habitat by (1) reducing the capability of the river to clean itself, (2) removing fine sediment from cobble areas, (3) reducing water levels below levels needed to maintain habitat (Holden 1979), or (4) altering temperature or flow patterns.

Substantial flow reductions have already occurred in the Colorado River, reducing the physical size of the river. It would appear the major change that has occurred in the native fishes is that several fish species have become rare and the roundtail chub has probably extended its range downstream in the last 100 years (Jordan 1891). Introduced species have become abundant at the same time. The depletion due to the CCSOP or GCC would continue this trend of gradual habitat alteration, probably to the detriment of the native fishes. Changes in temperature and sediment transport are not expected to be significant (Simons, Li & Associates 1983).

The water supply system for the CCSOP would potentially impact all three rare fishes (Colorado squawfish, humpback chub, razorback sucker) in the main stem Colorado River. As described above, the intake would primarily cause impact through entrainment at De Beque and water depletion in the Colorado River from De Beque to Lake Powell. Entrainment of fish at the De Beque intake could include razorback suckers. The slow

water area created at the mouth of the intake structure could tend to concentrate adult razorbacks since they generally prefer quiet water habitat (Wick et al. 1982). Velocities are sufficient to entrain adult fish, although many adults would probably be able to swim out of the intake current.

Young razorbacks (a Colorado-listed species) have seldom been found in the wild, and there is considerable concern over whether they actually are reproducing in the upper Colorado Basin, even through adults in spawning condition have been found (Wick et al. 1982). It is possible that young razorbacks use habitats that are not readily sampled, or that they are confused with the young of the more abundant flannelmouth sucker. Also, the razorbacks near De Beque have been isolated from other populations by the Government Highline Canal Dam (about 25 miles downstream of De Beque), constructed in the early 1900's. It follows that reproduction may have occurred at least sporadically since then to maintain the species. Therefore, indirect evidence suggests that successful reproduction, and thus young razorbacks, have occurred in the river near De Beque sometime in the not-too-distant past, and may occur again in the future. Thus, the De Beque intake structure could entrain young razorback suckers, a significant adverse impact.

Larvae and adults of Colorado squawfish, adult humpback chub, and adult (and perhaps young) razorback suckers are all found in the vicinity of the proposed Loma intake. The Loma intake design includes measures to eliminate fish entrainment (Chevron 1983b), and consequently no significant loss of rare fish is expected.

The loss of flow in the Colorado River due to CCSOP and GCC operations may have severe consequences for the threatened and endangered fishes. As background information to support this statement, it should be noted that the FWS has recommended flow levels which they feel are necessary to maintain habitat for Colorado squawfish and humpback chub (Table 4.7-3). These numbers have not received extensive scientific peer review or undergone public rule-making procedures. These levels are used by the FWS in Section 7 consultation under the Endangered Species Act to determine jeopardy or nonjeopardy opinions (USFWS 1983).

In order to compare the impacts of the CCSOP to the FWS recommended flows, the effects of 10 proposed projects that have already entered Section 7 consultation with the FWS had to be determined. (These projects are included with the USGS baseflows to assess potential impacts of additional projects such as the CCSOP.) Since operation plans for most of these 10 projects were not available for the period of record (1962-1981), effects of these projects were estimated using available data.

This depletion analysis resulted in flow frequency values for the FWS recommended flow periods shown in Table 4.7-3. Table 4.7-4 shows the frequency that the FWS flows in Table 4.7-3 were not met for the 1962-1981 baseflow after depletion of the 10 projects, CCSOP, and GCC operations were analyzed. A more detailed analysis of flow depletions will be made for the forthcoming Biological Assessment for the CCSOP; it will include updated operations plans for the 10 projects. This methodology, including the recommended flows and base flows, was used for purposes of projecting potential impacts on threatened and endangered fishes because it was the best methodology available at this time.

The analysis (Table 4.7-4) indicated that USGS baseflows for 1962-1981 did not meet the USFWS recommended criteria for Colorado squawfish spawning flows in July and spawning flows for humpback chub May 1-15 (1½ months total). The 10 projects depleted flows below FWS recommended habitat maintenance levels in December and May 1-15, and humpback chub spawning flows June 1-15, in addition to depleting spawning flows in July and May 16-31 even more. Therefore, the baseflow upon which the CCSOP and GCC depletions are assessed would already be below FWS recommended levels for May, part of June, and all of July and December. Any additional depletions during these 3½ months could further affect the endangered fish by alteration of habitat as defined by the FWS recommended flow levels. The CCSOP could deplete flows further during these 3½ months, and thus create adverse impacts on the endangered fish based on the FWS recommended flows. The GCC projects could deplete habitat maintenance flows below FWS recommended levels during January as well (a 4½-month period).

Flushing flow levels were also exceeded quite often by USGS baseflows and the 10 projects added an additional year when they were not met. Neither CCSOP or GCC depletions changed these values.

Table 4.7-3 USFWS RECOMMENDED MINIMUM FLOWS AND TEMPERATURE REQUIREMENTS FOR THE COLORADO RIVER^a

River Reach	Reason for Flow	Period	Flow (cfs)	Temperature (°C)
Green - Gunnison	Habitat maintenance	Oct 16 - May 15	2,000 ^b	
Moab - Gunnison	Colorado squawfish spawning	Jun 16 - Jul 31	4,000 ^c	20-22
Cataract - Moab	Colorado squawfish rearing	Aug 1 - Oct 15	2,000 ^c	20-28
Green - Gunnison	Flushing flow	May - Jun (runoff)	17,000 ^d	
Gunnison - Palisade	Flushing flow	May - Jun (runoff)	8,000 ^d	
Westwater Canyon and Black Rocks	Humpback chub spawning	May 16 - Jun 15	10,000 ^c	16-18

Source: USFWS (1983).

^a These numbers have not received extensive scientific peer review or undergone public rulemaking procedures.

^b Flow cannot be depleted below this level for more than 10% of the time based on the period of 1862 - 1981.

^c Flow cannot be depleted below this level for more than 25% of the time based on the period 1962 - 1981.

^d This flow must be met for 5 consecutive days each year.

The water rights scenarios for the CCSOP and GCC were not analysed, but their relatively high depletion levels would probably cause additional exceedances of FWS recommended levels, especially considering the total 567.25 cfs of water rights below Loma. Therefore, all levels of proposed water depletions would not meet FWS recommended flow levels and would cause significant adverse impacts.

The effects of flow depletion on endangered Colorado River fishes include alterations in habitat and changes in temperature and flow patterns (Miller 1963; Holden and Stalnaker 1975; Seethaler 1978; Holden 1979). The changes in flow are a major factor for the decline of Colorado squawfish (Holden and Wick 1982) and bonytail and humpback chub (Valdez and Clemmer 1982) in the remaining riverine portion of the upper Colorado River basin. The competition and/or predation of introduced species are also regarded as major factors in the decline of these species (Miller 1963; Behnke and Nugent 1983; Molles 1980), but it appears that these interactions with introduced species are primarily important in marginal habitat caused by depleted flows (Holden 1979; Holden and Wick 1982; Valdez and Clemmer 1982). Therefore, the depletions of the CCSOP and the GCC joint venture would increase the adverse impacts of past flow depletions on these endangered species in the Colorado River.

In addition, depletion near De Beque could alter habitat for razorback suckers. Although depletions of the CCSOP in their operations study are only a small percentage of the river flow, they are continuing a trend of reduced flow that was started by the earliest irrigators along the upper Colorado River in the 1800's. Rare fish populations have declined during the same period as these depletions have occurred, accompanied by major changes in reproductive success of all four species (Holden 1980; Miller et al. 1982c). The razorback sucker is a large river species, and for populations such as the one near De Beque, continued gradual depletion has slowly altered their habitat so the Colorado is no longer considered a large river. The CCSOP depletions, therefore, cannot be shown to cause significant impact by themselves, but when analyzed as part of a major change, their potential for adverse impact increases.

It is difficult to say at this time if the razorback population near De Beque is declining because the river has been depleted, or because competition and predation has increased at the expense of the razorback's reproductive success. If the former is the case, the CCSOP or GCC would make little additional difference. On the other hand, this population may be reproducing once every 5 years or so, and therefore maintaining itself. The CCSOP

depletions could reduce rates of reproductive success to levels that would cause the eventual loss of the population. To recall, the GCC operation plan withdrawals would generally cause depletion about 4 times as great as the CCSOP; therefore, the likelihood of this depletion negatively affecting razorback sucker reproduction is greater than for the CCSOP by itself. Likewise, the two water right scenarios could cause even greater potential impact.

The hybrid humpback chub population just below De Beque suggests that pure humpback chubs may inhabit the area presently, or did inhabit the area in the recent past. The extensive hybridization is probably a reflection of past habitat alterations due to water depletion (Valdez and Clemmer 1982). The CCSOP and GCC depletions would add to this problem and limit the ability of a pure population to exist. Further study of this population is needed to clarify the potential for impact.

Spent Shale Disposal. The spent shale disposal area should not impact aquatic ecosystems other than upper Clear Creek, which would be heavily impacted by all the mining activities. Downstream water quality should not be

Table 4.7-4 PERCENT OF TIME FWS-RECOMMENDED COLORADO RIVER FLOWS WERE NOT MET DURING THE 1962-1981 PERIOD OF RECORD RESULTING FROM PROJECTED DEPLETIONS BY THE CCSOP AND GCC PROJECTS

Period	Flow Requirement in cfs (Frequency)	USGS 9162-81 Baseflow	10 Projects Depletion	CCSOP	GCC
Green - Gunnison					
Oct 16-31	2,000 (10%)	c ^a 1.9	c 2.5	s 3.1	s 3.1
Nov	habitat maintenance	s 0.2	s 0.5	s 0.5	s 0.5
Dec		s 3.9	s 15.9 ^b	c 16.9 ^b	s 18.3 ^b
Jan		s 5.5	s 9.6	s 9.9	s 12.9 ^b
Feb		s 5.0	s 5.7	s 5.7	s 6.6
Mar		s 5.6	c 2.2	c 2.2	c 3.4
Apr		s 7.2	c 8.0	c 8.0	c 8.3
May 1-15		c 3.7	c 16.6 ^b	c 17.0 ^b	c 17.8 ^b
Moab - Gunnison					
Jun 16-31	4,000 (25%)	s 11.7	s 14.7	s 15.3	s 15.9
Jul	squawfish spawning	s 37.6 ^b	s 41.5 ^b	s 41.7 ^b	s 42.7 ^b
Cataract - Moab					
Aug	2,000 (25%)	c 19.2	c 19.5	s 19.0	s 21.7
Sep - Oct	squawfish rearing				
1-15	Cataract - Moab	c 4.7	c 12.3	c 14.4	c 16.8
		s 7.3	s 7.4	c 8.3	s 8.7
Green - Gunnison					
May - Jun	17,000 (5 consecutive days) flushing flow	not met 8 years	not met 9 years	not met 9 years	not met 9 years
Gunnison - Palisade					
May - Jun	8,000 (5 consecutive days at Cameo gage) flushing flow	not met 3 years	not met 4 years	not met 4 years	not met 4 years
Westwater Canyon - Black Rocks					
May 16-31	10,000 (25%)	s 27.3 ^b	s 32.4 ^b	s 33.0 ^b	s 33.0 ^b
Jun 1-15	humpback chub spawning	s 21.4	s 30.6 ^b	s 30.6 ^b	s 31.2 ^b

^a Denotes location of stream gage used for analysis: s = Stateline, c = Cisco.

^b Denotes flows below FWS recommended levels.

affected since no discharge is planned from the water control ponds except to prevent overtopping during very large storm events (100 years or greater). The chance of water release occurring is very low, and the impact on lower Clear Creek and Roan Creek would be minimal since these areas would already be heavily impacted.

The diversion of the West Fork of Willow Creek and upper Clear Creek through the underground mine (before its return to the lower Clear Creek channel) would cause a degradation in water quality to a level potentially toxic to aquatic organisms. This water would eventually reach Roan Creek reservoir, and primarily affect a section of stream that would already be seriously degraded.

Following abandonment of the project, eventual failure of the spent shale areas would occur as a result of natural erosional processes (Shelton 1982), even with successful reclamation. This could result in a continued leaching of poor quality water into the Clear Creek system, which could inhibit the ability of the stream to sustain aquatic life.

Endangered fishes in the Colorado River system could be impacted by poor water quality discharge only if the Roan Creek dam should fail. The probability of failure is very slight, so no significant impact should occur.

Clear Creek Alternative (CC-100)

Impact of the CC-100 alternative would be similar to that of the Proposed Action, except that impacts associated with the Loma water intake and associated pipeline corridor would not occur. This means that approximately 25 miles of Clear Creek would be significantly altered and that all of the required water would be withdrawn at De Beque and from the wells and mesa surface streams. Therefore, flows between De Beque and Loma would be decreased by the amounts shown in Table 4.7-1 for the CCSOP only, and the amounts in Table 4.7-2 for the total GCC, as would the remainder of the Colorado River. Impacts due to entrainment of larvae and juvenile fish at De Beque would remain high, especially at the water rights depletion level of 268.75 cfs for the CCSOP only, and at 442.25 cfs for the GCC partners. Habitat change due to the flow depletion would continue as in the PA-100, and be slightly increased in the section between De Beque and Loma because all the water would be withdrawn at De Beque.

Colorado squawfish would be impacted by the flow depletion similar to that described in the PA-100. The suspected spawning site near Clifton, just upstream from Grand Junction, would be affected more adversely under this alternative since more water would be depleted from that section of the river.

The razorback sucker (a Colorado-listed species) would be impacted as described for the PA-100, except that the additional depletion at De Beque would increase the likelihood that reproduction would be less successful than in the recent past. Entrainment of juvenile (and perhaps larval) razorbacks may also occur as in the PA-100.

The humpback chub would be affected as described under PA-100. Colorado River cutthroat trout (a Colorado-listed species) would be impacted by pipeline construction and operation as described for PA-100.

Production Rate Alternatives (PA-50, CC-50)

The 50,000 bpd production rate would have significantly less aquatic ecology impacts than the 100,000-bpd rate. Impacts to the Clear Creek-Roan Creek system would be limited to the depletion and disruption of upper Clear Creek by the upstream and bypass water control reservoirs (see Figure 4.4.2). The Willow Creek system should not be impacted. Lower Clear Creek and Roan Creek would experience reduced flows due to the two water control reservoirs and alluvial and mesa pumping. Therefore, approximately 5 miles of upper and middle Clear Creek that presently support rainbow trout would be significantly degraded. Lower Clear Creek and Roan Creek would also be impacted by reduced flows, but since this area is presently poor aquatic habitat due to intermittent flow, no significant loss would occur. Some sedimentation and perhaps degradation of water quality from shale disposal sites and general mining-retorting activities may occur, but proper design and construction of water control features should eliminate significant impact.

Entrainment of young fish at De Beque by the CCSOP would be about 50 percent less than the 100,000-bpd rate since the rate of water withdrawal would be reduced to about half of the 100,000-bpd rate. Intake velocities would remain high since fewer pumps would be used, so entrainment losses could remain significant. Entrainment loss due to the planned GCC operations plans withdrawal would be nearly 7 times that of the 50,000-bpd CCSOP, and both water rights scenarios would significantly increase the potential entrainment impacts. Therefore, in the worst case, significant entrainment impacts would occur, especially at the GCC operations plan and the CCSOP and GCC water rights scenarios.

The impact of water depletion on the Colorado River would be similar to that described for the 100,000-bpd alternative, but to a lesser extent. Habitat changes due to altered flow patterns would still occur. Changes in temperature and sediment transport characteristics of the river are expected to be minimal except at the maximum divertable rates of 268.75 cfs for the CCSOP and 442.25 cfs for the GCC (Simons, Li and Associates 1983).

Colorado River cutthroat trout would still be affected by potential pipeline construction and breakage near Willow Creek in the White River drainage under the 50,000-bpd alternative. Pipeline breakage would not be statistically expected to occur due to the shorter life of the project (25 years), and therefore a relatively low likelihood of breakage exists. Razorback suckers would be potentially affected by the De Beque intake due to entrainment of young, although rates of entrainment for the CCSOP would be reduced to about half of the 100,000-bpd alternatives. All three rare fish would be affected by water depletions (see Tables 4.7-3 and 4.7-4). As explained above, the CCSOP scenario would still deplete during 3½ months when flows are below FWS levels. Total GCC depletions would add another month when FWS levels are exceeded. Humpback chubs could still have increasing pressure by predation from introduced species and due to flow depletions.

4.7.3 Grand Valley and Associated Siting Activities

Fruita I Alternative (FI-100)

The Fruita I alternative would have similar impacts associated with the Proposed Action. In addition, construction activities associated with development of upgrading facilities in the Grand Valley area could potentially affect several adjacent aquatic systems: Mack Mesa Reservoir, Highline Lake, Big Salt Wash, Little Salt Wash, Reed Wash, and Highline Canal. As with most construction activities, the primary impacts to the aquatic ecosystem would be related to sedimentation and/or the direct destruction of habitat. With the use of proper sediment abatement practices, minimal impact to existing aquatic systems should result from the construction and operation of these facilities.

Other potential impacts associated with this alternative are related to corridors and corridor utilization. In addition to the corridors described for the Proposed Action, product and raw shale oil pipelines, transmission lines, and an all-weather road would be added to the Fruita to Clear Creek (Echo Lake) corridor. A corridor for a road, transmission line, and railroad would also be required to provide access to the Fruita site. These additional uses for corridors would subject potentially affected streams to greater construction impacts for more extended periods of time than would be the case if the corridor were used for a water pipeline only (as in the Proposed Action). However, these impacts would still not be significant, providing care was exercised during construction.

This alternative provides an increased potential for accidental spillage caused by train or truck accidents, or pipeline breaks, above the Proposed Action. This is a result of the increased length of oil pipelines and traffic between the upgrading and retorting facilities required by this alternative. Impacts associated with a spill are more likely to be significant than in the case for the Proposed Action, since portions of the pipeline route are much closer (7 miles versus 30 miles) to the Colorado River and to Mack Mesa Reservoir and Highline Lake. Syncrude spilled into these waters could cause substantial fish kills.

The impacts to threatened and endangered species would be similar to those described for the Proposed Action. In addition, the increased activity near Fruita would increase the likelihood of toxic spills into the Colorado River. Such an occurrence could be very detrimental to Colorado squawfish and humpback chub populations,

since concentrations of both these species are found below Fruita. Also, even if major spills do not occur, minor degradation of water quality in any of the streams or canals could affect Colorado squawfish and razorback suckers that utilize the mouths of these drainages along the Colorado River. Most of the impacts due to toxic spills or water quality degradation could be mitigated by proper water treatment, construction techniques, and adequate spill prevention, and cleanup plans and facilities.

Production Rate Alternatives (FI-50, FII-50)

The aquatic biology impacts of the 50,000-bpd Fruita I would include those described for the Proposed Action at 50,000 bpd. In addition, some impacts to Mack Mesa Reservoir, Highline Lake, and the Colorado River may occur due to construction, toxic spills, or water quality degradation as described in the 100,000-bpd discussion.

The Fruita II configuration would also have all the Fruita I (50,000 bpd) impacts, as well as the following additional concerns. The Straight-Line Tunnel route would cross Carr and Brush creeks, requiring bridge construction and resulting in possible habitat degradation. Impacts to these two small trout streams should be minimal, but could be severe in the case of accidental spills or pipeline breakage. Additional impacts in the Grand Valley area due to the increased potential for accidental spills of raw shale or breakage of product pipelines could also occur, but they should be minimized by proper construction and hauling procedures. Also, the shorter life of the project (25 years) would reduce the chance of pipeline failure to a lower level. The spent shale disposal areas are located closer to the Colorado River in this alternative, and therefore would have a higher potential for impacting Colorado River fish. Following abandonment of the project, erosion of the disposal piles could degrade water quality in East Salt Wash and the Colorado River; however, the probability of significant impact appears slight.

Threatened and Endangered Species. Impacts of the Fruita I alternative on threatened and endangered species would be similar to those for the Proposed Action at 50,000 bpd. Major concerns for threatened fish in the Colorado River, including effects of entrainment and water depletion, would still exist.

The Fruita II alternative would also have these impacts, plus potential impacts to the Colorado River cutthroat trout in upper Carr Creek by the Straight-Line Tunnel Route.

4.7.4 Alternative Siting Activities

Water supply. Three alternative diversion locations near Loma and two near De Beque have been identified (Figure 4.4-1). These areas are generally uniform in fish distribution (Valdez et al. 1982). Since the intakes require fairly long stretches of streambank, several instream habitat types would probably be affected by all alternatives. Therefore, no difference in impacts between the alternatives at the two sites would occur.

As an alternative to the De Beque diversion and Roan Creek Reservoir, the CCSOP has proposed a diversion at Parachute and a reservoir on Parachute Creek. The Roan Creek and Parachute Creek areas are planned for considerable oil shale development; therefore, both areas may be disturbed. Parachute Creek has cold water habitat in closer proximity to the Colorado River than does Roan Creek; therefore, loss of the Parachute Creek habitat would probably cause a more significant impact than Roan Creek. Also, the pipeline corridor to Clear Creek mesa would potentially disturb West Fork Parachute Creek or other cold water habitats. The Roan Creek-Clear Creek corridor would not affect cold water habitats. Therefore, the Parachute Creek site would have more potential for aquatic biological impact than the Roan Creek system, although the differences are small and probably insignificant.

Storage in Reudi Reservoir is another possible water supply alternative. The impact of Reudi Water Sales II will be analyzed in the EIS and biological assessment presently being prepared by the U.S. Bureau of Reclamation.

All of the alternative intake sites would cause similar impacts to rare fish as those discussed for the alternatives above. The Parachute Creek diversion system would have the same impact as the Roan Creek system.

Corridors. Alternative corridors that would have greater impacts to aquatic habitat and biota than the proposed routes include the Rangely A pipeline corridor and the Roan Creek Overland and Tunnel routes. The Rangely A corridor would cross headwaters of Douglas Creek, which contains trout. Pipeline construction or breakage could cause adverse impacts to these streams. The Rangely B pipeline corridor crosses no trout streams, and therefore would have few aquatic biology impacts.

The Roan Creek Overland and Tunnel corridors would potentially impact the trout population in upper Roan Creek by construction-related sedimentation and habitat alteration or disturbance.

All other alternative routes would have similar impacts to the proposed corridors.

Colorado squawfish in the White River could be affected by a pipeline break from either the Rangely A or B corridor. The statistical probability of this occurring at least once during the life of the 100,000-bpd alternative is great, but less for the 50,000-bpd alternative. The significance of the impact would depend on cleanup and amount of oil spilled, but in the worst case could be significant.

The Rangely A corridor would cross several headwaters of Douglas Creek that contain Colorado River cutthroat trout (a Colorado-listed species). These fish could be affected by sedimentation and habitat disruption during construction, or by pipeline breakage during operation. Proper construction techniques and adequate spill cleanup plans and facilities should minimize these problems.

4.7.5 Transportation Alternatives

Alternative means of transporting people, material, and products should not significantly change impacts to aquatic ecology. Corridors preferred (from the perspective of aquatic ecology) are short and are distant from surface water, especially those water bodies containing important aquatic biota.

Truck or rail haulage of coal cannot be differentiated in terms of potential for impacts to aquatic ecology on the basis of existing information. Assuming that the road and railroad would be equally distant from surface water, and that airborne losses of bulk material would be similar, impacts would be similar and minimal. Differences might exist due to different accidental spillage rates and any difference in chemical treatments (e.g., deicing chemicals) which may be required. Construction impacts could be increased if a railroad is added to a corridor, in comparison to upgrading a road in that corridor.

4.7.6 Hazardous Waste Disposal

Impacts associated with normal operation of a facility should be similar whether located on or off-site. Impact differences between the alternatives could result from transportation accidents or failure of the disposal facility containment system. Transportation accidents would have a greater chance of occurring if the off-site facility was used. Severity of potential impacts caused by containment system failure would be dependent on facility location and proximity to water bodies.

4.7.7 Secondary Impacts

The most significant secondary impacts would be those resulting from increased fishing pressure and water consumption caused by project-induced population growth. Increased municipal/domestic water consumption would further impact flows. These impacts were discussed in sections 4.7.1 through 4.7.4. Increased fishing pressure would impact those surface waters which are already heavily utilized, such as Carr Creek, Mack Mesa Reservoir, Highline Lake, and the Aspinall (Curecanti) Unit dams on the Gunnison River. Other secondary impacts would result from increases in point and non-point discharges associated with sewage treatment plants, housing developments, construction, and other activities necessary to support the increased population.

Fishes in the Colorado River, including the rare species, would be affected by the commercial extraction of gravel from the Colorado River floodplain. Such extraction, for the construction at the plant sites as well as for homes

and service structures for the employees of the CCSOP, could be extensive. Gravel pits have been identified as prime habitat for predacious exotic species, and their proliferation could be detrimental to the native species, especially the rare forms (Valdez et al. 1982).

4.8 Terrestrial Ecology

4.8.1 General Impacts

Construction and operation of project facilities and disposal of spent shale would affect vegetation and wildlife habitat through direct removal or through partial destruction by off-road construction equipment and vehicles. Impacts on plant productivity, nutrient cycling, and the physical habitat structure that plants provide would directly affect water runoff, soil erosion, and wildlife habitat quality. Modification of the existing topography and vegetational cover in the project area would affect habitat quality for most wildlife groups. At most project facility sites, changes in the extent and distribution of habitat types may result in long-term reduction of the abundance of some species. In general, these environmental changes would affect populations of wildlife species which (1) require access to multiple cover types, (2) occupy relatively large home ranges, and (3) have relatively low reproductive rates (e.g., big game, raptors, and some mammalian predators). Project impacts to populations of species which exhibit higher reproductive capacities and occupy smaller home ranges (e.g., amphibians, small mammals, and songbirds) would be much less significant within the region.

Although vegetation removal would be an impact similar for most project alternatives, the extent of this impact would vary widely among different project activities. Construction of roadways, railroads, and reservoirs as permanent facilities would result in residual impacts on productivity. Disturbance areas associated with pipeline burial, transmission tower construction, and slopes adjacent to access routes would be revegetated in the short term. Mining and plant site revegetation would occur over the long term. Spent shale disposal areas would undergo long-term revegetation followed by possible degeneration of the vegetation occurring as spent shale is gradually uncovered by natural processes of erosion. Ongoing research in spent shale revegetation indicates that even weathered spent shale may be incapable of supporting native or desirable vegetation without management input such as leaching and fertilization (Redente and Cook 1981).

In addition to direct removal and destruction of vegetation, less predictable impacts to vegetation and wildlife could occur over the course of the 100-year project life. Human population growth and increased access to previously inaccessible areas could result in increased off-road vehicle (ORV) use and accidental range and forest fires on a local and regional basis. Oil and other chemical spills, with attendant toxic contamination, could impact wildlife habitats, soils, and vegetation. Upslope erosion could impact undisturbed vegetation at the margins of the open pit mine, the plant sites, reservoirs, and transportation routes.

Throughout the discussions that follow, commitments by the Operator to specific mitigation measures have been considered, therefore the magnitude and probability of many impacts will be diminished by the planned mitigation program. Mitigation specifications are described in Section 4.18 and listed in Appendix C-1.

It should be noted that the terrestrial Biological Assessment, required under the federal Endangered Species Act, was prepared independently of the EIS. Findings of these two efforts are consistent.

4.8.2 Clear Creek Mesa and Associated Siting Activities

Proposed Action - 100,000 bpd (PA-100)

Vegetation and Productivity. Direct impacts of the proposed action on vegetation and biological productivity are summarized in Table 4.8-1. Vegetation removal and disturbance would occur during the construction and operational phases of the project within a potentially affected area of approximately 44 square miles. If project decommissioning includes all sites except roadways and reservoirs, then approximately 12 percent of the potentially affected area, or 5 square miles, would be residually affected by vegetation removal. Revegetation

would be attempted on the remaining affected areas. Most of the vegetation of the area has moderate or high revegetation potential. However, desert shrublands, barren areas, Douglas-fir forests, and riparian woodlands, covering approximately 4,508 acres or 16 percent of the area, have low revegetation potential. Re-establishment of vegetation would be more difficult and more costly in these areas.

Impacts to productivity could be locally significant to some ranching operations but would be insignificant on a county or regional basis. Affected productivity is presented in Table 4.8-1. During the construction and operational phases of the project, available data suggest that up to 29,000 Animal Unit Months (AUMs) may be lost each year within the project area. Productivity is unevenly distributed within the area. Agricultural lands yield approximately 87 percent of utilizable production but only represent 7 percent of the potentially affected area. Up to 1,588 acres of agricultural lands, including pasture and cropland and exclusive of rangelands, could be directly and permanently impacted (Table 4.8-1). For perspective, this acreage is equivalent to about 2 percent of the irrigated agricultural acreage in the Grand Valley west of Grand Junction and east of the Colorado-Utah border.

Wildlife. Regional big game carrying capacity could be reduced as a result of direct habitat loss in areas of project development. Data descriptive of the total (herbaceous + woody) primary productivity are not available for potentially affected big game winter ranges in the region. Therefore, impacts of the PA-100 alternative on regional big game carrying capacity have been addressed based on the acreage of critical winter range that could be lost as a result of each project alternative. For PA-100, loss of critical winter range (CWR) for mule deer could be approximately 2,666 acres in the Clear Creek-Roan Creek area and 210 acres in the Big Salt Wash area (Table 4.8-2). Approximately 1,365 acres of elk CWR in the upper Clear Creek drainage would also be impacted. Approximately 952 acres of pronghorn habitat in the Grand Valley would be altered as a result of construction of the Big Salt Wash corridor, assuming a corridor width of 1,000 feet. The Operator is committed to scheduling construction activities, to the extent possible, to avoid critical big game habitats during key periods of time. In addition, no public access to critical wildlife habitats under CCSOP control would be allowed without consultation with CDOW and USFWS. In consultation with CDOW and USFWS, the Operator would develop an in-house wildlife monitoring program to include such studies as habitat condition and trend and big game population distribution and movements, where needed and as appropriate. Fencing would be minimized and designed in consultation with CDOW and USFWS.

Approximately 14,600 acres of summer and transitional ranges for deer and elk would be permanently altered within the heads of the Clear Creek and Roan Creek drainages. The value of affected areas following reclamation and cessation of activities would be dependent upon the degree to which existing patterns of topographic and vegetational diversity could be restored and maintained over geologic time. Re-establishment of springs, streams, and other sources of free water would be integral to reclamation success and restoration of big game habitat in areas affected by these activities. Although the value of surface mined lands as big game habitat could be partially, and perhaps temporarily (over geologic time) restored through revegetation with native plants, a long-term reduction in seasonal big game use and productivity would occur. Based on the Operator's revegetation plans for the CCSOP, restoration of vegetation type interspersions would be minimal. However, all disturbed lands would be revegetated with vegetation mixtures favorable to wildlife. Spent shale disposal activities near the head of Clear Creek would reduce the value of this area to big game as a result of reduction of topographic relief, changes in vegetational composition, and availability of free water. This area is presently a deer and elk spring concentration area (Chevron 1982x) and may be used for fawning and calving.

The Operator has proposed safeguards to prevent surface and ground water contamination through contact with spent shale and upward migration of trace and toxic elements into the plant rooting zone (Section 2.3 of the DEIS). Therefore, spent shale disposal in the Clear Creek and Willow Creek drainages would not be likely to result in uptake or bioaccumulation of toxic elements in plants or herbivorous wildlife.

Competition among ungulate species may occur as a consequence of reduction in size of big game winter ranges. The magnitude of this impact could be site-specific and could be minimized through compensatory off-site habitat enhancement. However, the general effects could be significant. Available carrying capacity on deer and elk winter ranges in the region is limited by the extent of such areas, fluctuating levels of forage productivity and availability, and utilization by domestic stock, deer, and elk.

Table 4.8-1 DIRECT IMPACTS OF THE PROPOSED ACTION ON VEGETATION AND PRODUCTIVITY

Project Components	Acreages of Vegetation Types ^a												Total Potentially Affected Acreage	Affected Annual Production	
	RI	GL	GS	SS	SB	PJ	BL	MS	SSS	AW	DF	AG		MOP ^b	AUM ^b
Open Pit Mine	60				2		106	1,548	7,787	1,160	432		11,095	3.9	2,120
Underground Mine							2	14	1,237	274	4		1,531	0.6	324
Mesa Valley Fill Spent Shale Disposal								86	1,251	286			1,623	0.6	333
Clear Creek Mesa Plant Site								7	366	1			374	0.1	62
Upper Dry Fork Reservoir	132		310	438	366	309						741	2,296	10.0	11,622
Reservoir at Garvey Gulch			127		37	46							210	0.2	87
Roan Creek Corridor ^c	279		49	619	956	656	9	217	173	12	99	647	3,716	8.8	10,174
Echo Lake Corridor ^c	90		307	122	2,687	602		429		679	397	38	5,672	1.7 ^d	942 ^d
Fruita to Grand Valley Plant Site 16 Road Corridor		207	66	651								629	1,553	2.3 ^d	2,872 ^d
La Sal Syncrude Pipeline Corridor	1	2	1					22	130	27			183	0.1	251
La Sal Transmission Line Corridor ^c													76	0.1	18
TOTALS	562	209	860	1,830	4,048	1,613	117	2,323	10,944	2,439	932	2,055	28,329	28.3	28,805
Percent of Total	2	1	3	5	14	6	1	8	39	9	3	7			

Table 4.8-1 DIRECT IMPACTS OF THE PROPOSED ACTION ON VEGETATION AND PRODUCTIVITY (Continued)

Project Components	Acreages of Vegetation Types ^a												Total Potentially Affected Acreage	Affected Annual Production	
	RI	GL	GS	SS	SB	PJ	BL	MS	SSS	AW	DF	AG		MOP ^b	AUM ^b

^a RI = Riparian

GL = Grassland

GS = Greasewood Shrubland

SS = Shadscale Shrubland

SB = Sagebrush shrubland

PJ = Pinyon-Juniper Woodland

^b MOP = Millions of Pounds

AUM = Animal Unit Months

BL = Barren Lands

MS = Mixed Shrublands

SSS = Sagebrush-Snowberry Shrubland

AW = Aspen Woodland

DF = Douglas-fir Woodland

AG = Agricultural

^c Acreages expressed represent a 1,000-foot wide corridor^d Assumes 30 percent of corridor removed from productivity^e Tower locations and actual vegetation affected are not known.

Reductions in the quantity and quality of mountain lion and black bear habitat would also occur as a result of the CCSOP. Both of these species characteristically utilize large home ranges and occur at relatively low densities. Therefore, potential impacts on mountain lion and black bear populations would most likely be restricted to the project area and would be of low intensity.

Table 4.8-2 SUMMARY OF ESTIMATED POTENTIALLY AFFECTED ACREAGES OF
BIG GAME CRITICAL WINTER RANGE FOR MAJOR FACILITIES
ASSOCIATED WITH PROJECT ALTERNATIVES

Alternative/Components	Potentially Affected Acreage ^a		
	Mule Deer CWR	Elk CWR	Antelope WR/CWR
Proposed Action (100,000 bpd)			
Open Pit Mine	---	68	---
Roan Creek Multi-Use Corridor	1,439	800	---
Big Salt Wash Multi-Use Corridor	795	567	952
Garvey Gulch Reservoir	210	---	---
Upper Dry Fork Reservoir	222	---	---
Syncrude Pipelines	Unknown	Unknown	Unknown
	2,666 +	1,435 +	952 +
Clear Creek (100,000 bpd)			
Open Pit Mine	---	68	---
Roan Creek Multi-Use Corridor	1,439	800	---
Access Corridor	---	---	---
Upper Dry Fork Reservoir	222	---	---
Syncrude Pipelines	Unknown	Unknown	Unknown
	1,661 +	868 +	0 +
Fruita I (100,000 bpd)			
Open Pit Mine	---	68	---
Roan Creek Multi-Use Corridor	1,439	800	---
Big Salt Wash Multi-Use Corridor	795	567	952
Garvey Gulch Reservoir	210	---	---
Upper Dry Fork Reservoir	222	---	---
Upgrading Plant Site	---	---	400
Syncrude Pipelines	Unknown	Unknown	Unknown
	2,666 +	1,435 +	1,352 +
Fruita II (50,000 bpd)			
Dry Gulch Shale Disposal	Unknown	---	Unknown
Roan Creek Multi-Use Corridor	1,439	800	---
Big Salt Wash Multi-Use Corridor	795	567	952
Garvey Gulch Reservoir	210	---	---
Upper Dry Fork Reservoir	222	---	---
Retort and Upgrading Plant Site	---	---	800
Railroad Mine to Plant Site	Unknown	Unknown	---
Syncrude Pipelines	Unknown	Unknown	Unknown
	2,666 +	1,367 +	1,752 +

^a (+) value indicates potentially affected average could increase due to unknown average affected by syncrude pipelines or Dry Gulch spent shale disposal site.

Table 4.8-3 RELATIONSHIPS OF PROPOSED ACTION COMPONENTS
WITH ENDANGERED PLANT SPECIES

Plant Species	Common Name	Status ^a	Facility Site ^{b,c}									
			UM	SM	PL	RU	RG	RC	SW	LS	DP	
<i>Sclerocactus glaucus</i>	Uinta Basin hookless cactus	Threatened				X	NS	X	NS	NS	NS	
<i>Phacelia submutica</i>	Phacelia	Category 1				X	NS	X	NS	NS	NS	
<i>Aquilegia barnebyi</i>	Barneby columbine	Category 2	X	X			NS		O	NS	O	
<i>Astragalus lutosus</i>	Dragon milkvetch	Category 2					NS	X	NS	NS	NS	
<i>Festuca dasyclada</i>	Fescue	Category 2		X			NS	O	O	O	NS	
<i>Cirsium perplexans</i>	Thistle	CNHI Concern				Xy	NS	X	NS	NS	NS	
<i>Sullivantia hapemanii</i> <i>v. purpusii</i>	Sullivantia	CNHI Concern	X	X			NS		O	NS	O	
<i>Thalictrum heliophilum</i>	Meadow rue	CNHI Concern	O	O				O	O			

^a Status based on USFWS (1980) and CDNR (1982).

^b Facility Sites:

UM = Underground Mine

SM = Surface Mine and Spent Shale Disposal

PL = Plant

RU = Reservoir - Upper Dry Fork

RG = Reservoir at Garvey Gulch

^c Occurrence:

X = verified population affected

Xy = tentatively identified population affected

RC = Multiple Use Corridor - Roan Creek

SW = Water Pipeline and Secondary Access Road Corridor - Big Salt Wash

LS = Syncrude Pipeline Corridor - La Sal Route 1

DP = Transmission Line Corridor - Davis Point

O = possibly present based upon habitat suitability

NS = preliminary study negative, mitigation will include field search prior to construction

Road kills of deer, antelope, and elk would increase above existing levels due to increased vehicle traffic along well-traveled roads during the life of the project. Based on the Operator's estimates of the demand for and operational schedules of trucks and trains required for materials transport, the Roan Creek corridor would pose the greatest potential for significant site-specific increases in big game road kills. Committed mitigation to reduce big game mortality would include enforcement of 30 mph speed limits at key big game crossing areas (as identified through monitoring studies) and implementation of appropriate means to minimize big game road or rail casualties, if kill frequency exceeds 10/mile/year. Appropriate means may include fencing and construction of big game passageways. Roadway shoulders and borrow ditches would also be reseeded with unpalatable vegetation. The Operator would implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site and would promote a wildlife protection education program as part of employee orientation. On a regional basis, increased traffic volume on existing major highways resulting from the CCSOP could be less significant due to their routing relative to big game (mule deer) concentration areas and established levels of vehicular use.

Reduction of upland gamebird populations within the project area would occur as a direct result of surface disturbances. At least 11 historical sage grouse leks could be lost on Clear Creek mesa. Since sage grouse densities in the project area are characteristically low compared to other areas of Colorado (Chevron 1981i), project activities would result in only local reduction of sage grouse densities. Approximately 1,120 acres of potential blue grouse nesting and brood habitat, consisting of aspen woodlands, would be lost from impacted areas on Clear Creek mesa. Blue grouse are locally abundant in the region and could re-establish themselves if restoration of aspen swales is incorporated in the reclamation plan for the mesa. Chukar, which inhabit portions of lower

Clear Creek canyon and Big Salt Wash, could be displaced as a result of habitat alteration associated with reservoir inundation and construction of access roads and pipelines. Impacts to mourning doves, which are abundant and widespread in the project area, would likely be insignificant and short-term since this species uses a wide range of habitats for cover. Pheasant and Gambel's quail populations in the Grand Valley would not experience any significant reduction as a direct result of the PA-100.

Open water habitat created by construction of the CCSOP reservoirs could attract increased numbers of waterfowl and shorebirds to the project area during migration and winter. Fluctuating water levels resulting from continuous inflow or withdrawal of water from these reservoirs could result in maintenance of open, ice-free water throughout the winter. Deep water conditions could benefit diving ducks (primarily mergansers and goldeneyes) as a feeding and staging area. Gently sloping shorelines and associated shallow water could attract dabbling ducks including mallards, blue-wing teal, and cinnamon teal.

Densities of most mammalian predators and furbearers within the project area would probably decrease in response to localized reductions of rodent prey populations. Small game, including cottontails and jackrabbits, could experience localized, short-term population reduction as a result of the construction and operation of most project facilities. Beaver and muskrat could benefit from the net increase in aquatic habitat following reservoir construction.

Riparian habitats along Clear Creek and Roan Creek could be directly impacted through removal of vegetation during project construction and through potential dewatering of these streams (Section 4.4.2). Any alterations of riparian communities as a result of the PA-100 would result in loss of riparian and wetland habitat utilized by game and nongame wildlife species. Habitat quality for many other terrestrial vertebrates would also be adversely affected by removal of riparian habitat. Increased abundance of amphibians and shorebirds could occur at reservoir sites in response to increased availability of food and cover.

Raptors, including three species of high federal interest (golden eagle, Cooper's hawk, prairie falcon), would be impacted through physical alteration of cliff and forest nesting sites, disturbance resulting from increased levels of human activity, noise generated by project operations, and short-term reduction of rodent prey populations.

Baseline data for the Clear Creek property and the Book Cliffs area indicate that several active and inactive golden eagle nests would be impacted through direct or indirect disturbance from the PA-100. Open pit mining and subsequent shale disposal activities in the Willow Creek drainage would result in loss of at least one active golden eagle nest and several inactive nests maintained during 1981-82 (Chevron 1981i; 1982p). At least three active golden eagle nests would be directly affected by increased human activity and reduction in rodent prey densities in the lower 4 miles of the Big Salt Wash corridor. Four additional nests, including one active one, would be impacted in a similar manner by construction and inundation of the Big Salt Wash reservoir. At the present time, the taking of active golden eagle nests is forbidden by the Eagle Protection Act. Final rulemaking which will govern issuance of permits for the taking of inactive and active, unoccupied golden eagle nests may be issued during 1983 (Webb 1983). The taking or transplanting of protected nests would occur according to specifically permitted action by USFWS and CDOW. The most current regional golden eagle population data compiled by the Colorado Division of Wildlife (1981) indicate that a minimum of 114 nesting pairs occupied northwestern Colorado during 1981. Nesting success was 85 percent and production averaged 1.2 per nest. These data suggest that loss of up to five nest sites within the CCSOP area would not jeopardize the regional status of the golden eagle. Committed mitigation would include (1) restriction of activity within an appropriate buffer zone around any occupied or active raptor nests except as provided by USFWS and CDOW, (2) development of an in-house wildlife monitoring program to determine nesting raptor distribution and status, and (3) design and construction of powerlines to prevent electrocution of migratory birds.

Two active prairie falcon eyries (USFWS 1983) located within one air mile of the Echo Lake multi-use corridor could also be impacted by CCSOP activities. Abandonment of these nest sites could occur as a result of project activities. The regional significance of the loss of two prairie falcon nests cannot be determined since regional nesting population estimates are not available. Impacts of the PA-100 alternative on prairie falcons and other nesting raptors is addressed in additional detail in the U.S. Fish and Wildlife Service Coordination Act Technical Assistant Report (USFWS 1983).

Prairie dog towns, which are the preferred habitat of the burrowing owl (a species of high federal interest), and the black-footed ferret (federally listed as endangered) may be impacted by project construction activities in the Grand Valley. Impacts to prairie dog towns can be minimized through siting options available within the Grand Valley access corridor. Since no concentration areas for other terrestrial vertebrates listed by the Colorado Natural Heritage Inventory (CDNR 1981b) as sensitive species were identified during baseline surveys, impacts resulting from the PA-100 are not likely to jeopardize populations of these species within the project area.

Endangered Species. The PA-100 would significantly affect populations of several candidate or listed threatened or endangered plant species. Recently completed baseline studies permit the identification of some of the site-specific impacts to these populations. Since only the Roan Creek reservoir sites, Roan Creek corridor, and portions of the Clear Creek mesa were searched, it is possible that additional populations of certain species would also be affected. Table 4.8-3 identifies known and likely occurrences of eight plant species with respect to the major component areas of PA-100. A relatively large population of the Uinta Basin hookless cactus (*Sclerocactus glaucus*), including an estimated 300 individual plants, would be affected by construction of the Upper Dry Fork reservoir. A second population of this cactus, which is of similar size, would be affected by the construction of an access road just east of this reservoir. Six additional populations occur within the Roan Creek corridor but could probably be avoided during construction (BLM 1983c). Other known populations of *Sclerocactus glaucus* include nine locations in five Colorado counties and a similar number of locations in eastern Utah (CDNR 1982).

During the early summer months of 1982, several thousand individuals of the annual phacelia (*Phacelia submutica*) were found in two populations which would be inundated by the Upper Dry Fork reservoir. A third population of this plant species occurs within the Roan Creek corridor just north of De Beque. Two additional phacelia populations occur within 200 feet of the proposed reservoir's western shoreline. These populations could be damaged by peripheral disturbances during reservoir construction. Four additional locations, all in Mesa County outside of the project area, represent the only other known populations of this plant (CDNR 1982).

Barneby columbine (*Aquilegia barnebyi*) and sullivantia (*Sullivantia purpusii*) populations would be affected by the development of the open pit mine and spent shale disposal area in Willow Creek and No Name Creek. A third area containing populations of both species would be affected by spent shale disposal in Clear Creek canyon. Based upon 52 population location records for Colorado, CNHI has suggested that Barneby columbine not be listed as threatened or endangered. *Sullivantia purpusii* is known only from 16 population locations in four Colorado counties (CDNR 1982).

Dragon milkvetch (*Astragalus lutosus*) occurs in a population which could be affected by the construction of the access road within the Clear Creek drainage. Numerous other localities with populations of this plant species are also known and it is unlikely that the proposed project would place the species in jeopardy.

A population of unknown size of *Festuca dasyclada* would be affected by the spent shale disposal and open pit operation. In December 1982, the CNHI computer file listed 24 other population locations for this plant within Rio Blanco and Garfield counties.

Many thousands of basal rosettes of a plant tentatively identified as *Cirsium perplexans* were observed during field surveys of the Upper Dry Fork Reservoir area. Additional field study would be required to verify the identity and status of this population. *Cirsium perplexans* is endemic to four western Colorado counties.

PA-100 would not likely result in any direct, long-term or significant impacts to state or federally listed endangered wildlife species. Direct project-generated disturbance of wintering bald eagles along the Colorado River could be effectively mitigated through siting of intake facilities to avoid important roost sites in the vicinities of both the De Beque and Loma intake locations and timing construction to avoid peak periods of eagle concentration. Habitat enhancement for wintering bald eagles could be possible at reservoir sites through stocking of rough fishes and establishment of roost and perch sites. Disturbance of prairie dog towns in the 16 Road corridor would be limited to the periphery of one established colony (Chevron 1982a) and therefore would not jeopardize the viability of the local population of the white-tailed prairie dog. Hence, direct impacts to potential black-footed ferret habitat would be negligible.

No impacts to the whooping crane (federally listed endangered) or greater sandhill crane (state listed endangered) would be likely as a result of project development.

Although the upper Roan Creek drainage is considered as essential habitat for the peregrine falcon, nesting activity has not been documented in the drainage (Craig and Enderson 1981). Potentially suitable cliff nesting sites within the area of direct project impact are limited due to the instability of ledges. However, habitats supporting high densities of medium-sized avian prey in close proximity to cliffs with a wide field of unrestricted view are common in the Roan Creek drainage (Craig et al. 1978). Therefore, potential impacts of PA-100 on peregrine falcons would be limited to reduction of potential habitat for feeding and disturbance of potential nesting cliffs (in the lower Roan Creek valley) which could be utilized by an expanding peregrine population or following future peregrine reintroduction efforts.

Proposed Action - 50,000 bpd (PA-50)

Vegetation and Productivity. Vegetation removal and consequent effects on productivity for PA-50 would be significantly less than PA-100 alternative due to use of all underground mining. The size of the spent shale disposal area would be increased by approximately 1,400 acres, but the overall area likely to be disturbed would be reduced by more than 50 percent. Vegetation impacts associated with ancillary facilities would be essentially the same as those described for PA-100.

Wildlife. Direct impacts to big game winter ranges for the PA-50 alternative would be similar to those of the PA-100. Loss of spring transitional range as a result of shale disposal activities in Upper Clear Creek would be increased by a maximum of approximately 1,377 acres. Spring transitional deer and elk range in the area of the proposed open pit mine totaling approximately 11,095 acres (Table 4.8-1) would be left essentially intact under this the PA-50 alternative. Three historical sage grouse leks and an active golden eagle nest site would not be physically removed as would be the case under the PA-100 alternative. A reduction of less than 50 percent in road kills (compared to the PA-100 alternative) within the Roan Creek corridor can be anticipated under this alternative as a result of decreased materials transportation needs. Mitigation strategies would be the same as those proposed for the PA-100 alternative.

Endangered Species. Potential impacts to candidate and listed threatened and endangered plant species would be primarily associated with ancillary facilities and would be the same as the PA-100 alternative. However, impacts to cliff and talus habitats which support several candidate plant species could be avoided or reduced depending on underground mine portal location and other siting alternatives.

Potential impacts to threatened and endangered wildlife species from the PA-50 alternative would be as described for PA-100. Loss of potential peregrine falcon hunting habitat would not occur in the Upper Willow Creek area; however, noise and human activity in this area would likely preclude any potential for nesting in the Clear Creek drainage.

Clear Creek Mesa - 100,000 bpd (CC-100)

Vegetation and Productivity. The total area potentially affected by vegetation removal or disturbance for the CC-100 alternative would be approximately 21,000 acres, significantly less than that potentially affected by the PA-100 alternative due to the absence of the Big Salt Wash corridor. Most of the affected area has moderate or high revegetation potential. However, vegetation types with low revegetation potential cover approximately 2,668 acres or 13 percent of the area.

Annual productivity affected by the CC-100 alternative would be approximately 24,900 AUM, or 3,900 AUM less than for the PA-100 alternative. Approximately 1,388 acres of irrigated agricultural lands would be potentially affected, 32 percent less than for PA-100.

Wildlife. Direct impacts to big game resulting from the CC-100 alternative would be confined to the Roan Creek and Clear Creek drainages where an estimated 1,661 acres of deer CWR would be lost (Table 4.8-2). The

magnitude of secondary impacts resulting from displacement of big game from the Clear Creek area to surrounding areas would be lower as a result of the CC-100 alternative than for the PA-100. Likewise, the extent, magnitude, and duration of impacts to winter, summer, and transitional range for deer and elk would be lower as a result of this alternative, in direct proportion to the reduction in extent of surface disturbance.

Impacts of the CC-100 alternative on game birds, predators, furbearers, and small game mammals would be similar in nature to those discussed in Section 4.8.2. However, the magnitude and extent of these impacts would be of lower magnitude under this alternative than for PA-100 since surface disturbance would be more limited in extent. Chukar habitat in Big Salt Wash, sage grouse leks, and habitat for sage and blue grouse transected by the Big Salt Wash corridor would not be affected by CC-100.

Nongame birds, mammals, reptiles, and amphibians would be affected by this alternative as discussed for PA-100. However, impacts to most raptors (including golden eagles) would be of lower intensity than for the PA-100 alternative since the extent and magnitude of reduction of nongame mammal and bird prey populations would be more localized. A minimum of one active golden eagle nest, and associated inactive nests which have been maintained during 1981 and 1982, would be affected in upper Willow Creek as a result of this alternative. Alteration of preferred cliff nesting sites of raptors would likewise be confined to those near the heads of Roan Creek and Clear Creek.

No long-term or significant impacts to CNHI "sensitive species" are anticipated from CC-100.

Mitigation measures for the CC-100 would be the same as those proposed for the PA-100 alternative.

Endangered Species. Effects of this alternative on candidate and listed threatened or endangered plant species would be the same as the PA-100 alternative.

Impacts to wintering bald eagles along the Colorado River near De Beque and peregrine falcon habitat in the Roan Creek drainage can be expected to be of similar magnitude for PA-100. The potential for disturbance of wintering bald eagles would be less than for the PA-100 alternative since the Loma intake would not be constructed or maintained. Potential black-footed ferret habitat (prairie dog towns) in the Grand Valley would likewise not be disturbed by CC-100 project operations.

Clear Creek Mesa - 50,000 bpd (CC-50)

Vegetation and Productivity. Long-term vegetation and productivity impacts associated with the open pit mine would be eliminated under this alternative and the total disturbed area would be less than for any other alternative. Impacts associated with permanent facilities would be the same as the CC-100 alternative and approximately 4 square miles would be residually affected.

Wildlife. Potential wildlife impacts resulting from this alternative would be the least extensive and of the lowest magnitude in comparison to impacts of all other alternatives under study. Direct project impacts in the Big Salt Wash area and Game Management Unit 30 would be essentially eliminated. Reduction in the extent of surface disturbance and the scale of project operations in the Roan Creek drainage could be expected to result in lessening of impacts to wildlife. Mitigation strategies would be similar to those proposed under the PA-100 alternative.

Endangered Species. Potential impacts to candidate and listed threatened and endangered plant species would be the same as the PA-100 alternative. However, impacts to talus and cliff habitats of several candidate species could be reduced under this alternative, depending on the specific configuration of underground mine portal development.

Potential impacts to threatened and endangered wildlife from CC-50 would be of the lowest magnitude and the most limited extent of all project alternatives.

4.8.3 Grand Valley and Associated Siting Activities

Fruita I - 100,000 bpd (FI-100)

Vegetation and Productivity. Direct impacts of the FI-100 alternative are identified in Table 4.8-4. The construction and operation of the project in this configuration could involve the removal or disturbance of vegetation within a potentially affected area of approximately 49 square miles. Additional impacts associated with FI-100 include the upgrading plant site; intertie and syncrude pipelines between Clear Creek mesa and the upgrading plant site; and a transmission line, natural gas pipeline, and railroad between the town of Fruita and the upgrading plant site. The various ancillary facilities which would be included within the 16 Road corridor would traverse highly productive irrigated agricultural land. The impacts on vegetation resources for the FI-100 alternative would be the highest of all alternatives.

The shift of project activities to lower altitude sites for the FI-100 would increase acreage of disturbance of desert shrubland vegetation types with low revegetation potential. Approximately 6,000 acres, or 19 percent of the potentially affected area, is included within riparian woodland, desert shrublands, barren areas, or Douglas-fir forests, which would be difficult to re-establish.

The potential impact of the project on agricultural production is higher for the FI-100 alternative than for any other configuration (Table 4.8-1). A difference of approximately 9,000 AUM between the FI-100 and PA-100 alternatives is largely due to impacts on agricultural lands, with siting within the Grand Valley resulting in greater potential impacts.

Wildlife. Impacts to game species affected by the Fruita I alternative would be similar in nature, extent, and duration to those discussed for the proposed action (100,000 bpd; Section 4.8.1). Construction and operation of a railroad between Fruita and the Grand Valley plant site would affect habitat use patterns of the remnant pronghorn herd in this area. In addition to direct loss of habitat resulting from its construction, noise generated by this railroad could be expected to modify game movements and game use of habitats transected. An estimated 1,352 acres of pronghorn habitat would be lost (Table 4.8-2) for the duration of the project as a result of project-related activities in the Grand Valley. Ancillary facilities developed in conjunction with the Grand Valley plant site would be expected to incur only short-term, minimal impacts to local game populations since no critical ranges or other sensitive habitats for game would be physically altered.

In addition to impacts described for PA-100, construction and operation of the Grand Valley facility and corridors would result in localized wildlife impacts of low magnitude and relatively short duration. Based on information available concerning raptor use in this area, displacement of nesting raptors for areas directly impacted by the FI-100 alternative would not be detrimental to the regional viability of these species. Additional loss of riparian habitat along Big Salt Wash from corridor construction could be a long-term impact, displacing several nongame species and reducing of habitat quality for many others. Further details concerning specific impacts of the FI-100 alternative on raptors and other nongame species was presented in the Coordination Act Technical Assistance Report (USFWS 1983). Mitigation for the above impacts would be similar to that proposed for the PA-100 alternative.

Endangered Species. The populations of candidate and listed threatened and endangered plant species and Colorado Natural Heritage Inventory plant species of special concern which would be impacted by implementation of the PA-100 would also be affected by the FI-100 alternative.

Potential effects of the FI-100 alternative on endangered wildlife species and their habitats would be similar in extent, duration, and magnitude to those described for the PA-100 alternative. Construction and maintenance of an upgraded road, the railroad, pipeline, and power transmission facilities along 16 Road between Fruita and the Grand Valley plant site could involve disturbance of additional acreage of white-tailed prairie dog towns. The resultant disturbance to potential habitat for black-footed ferrets would be a local, insignificant impact which could be mitigated through siting alternatives available.

Table 4.8-4 DIRECT IMPACTS OF THE FRUITA I ALTERNATIVE ON VEGETATION AND PRODUCTIVITY (in acres)

Project Components	Vegetation Types ^a												Total Potentially Affected Acreage	Affected Annual Production	
	RI	GL	GS	SS	SB	PJ	BL	MS	SSS	AW	DF	AG		MOP ^b	AUM ^b
Open Pit Mine	60				2		106	1,548	7,787	1,160	432		11,095	3.9	2,120
Underground Mine							2	14	1,237	274	4		1,531	0.6	324
Mesa Valley Fill Spent Shale Disposal								86	1,251	286			1,623	0.6	333
Clear Creek Mesa Plant Site								7	366	1			374	0.1	62
Grand Valley Plant Site			1,216	384	1,600								3,200	0.5	247
Upper Dry Fork Reservoir	132		310	438	366	309						741	2,296	10.0	11,622
Reservoir at Garvey Gulch			127		37	46							210	0.2	87
Roan Creek Corridor ^c	279		49	619	956	656	9	217	173	12	99	647	3,716	8.8 ^d	10,174 ^d
Echo Lake Corridor ^c	90		307	122	2,687	602		429		679	397	38	5,672	5.6	3,142
Fruita to Grand Valley Plant Site 16 Road Corridor ^c		207	66	651								629	1,553	7.8	9,573
Parachute Creek Synchrude Pipeline Corridor	1	2	1					22	130	27			183	0.1	251
Parachute Creek Transmission Line Corridor ^c													76	<0.1	18
TOTAL	562	209	2,076	2,214	5,648	1,613	117	2,323	10,944	2,439	932	2,055	31,529	38.2	37,953
Percent of Total	2	<1	7	7	18	5	<1	7	35	8	3	7			

^a RI = Riparian

GL = Grassland

GS = Greasewood Shrubland

SS = Shadscale Shrubland

SB = Sagebrush shrubland

PJ = Pinyon-Juniper Woodland

^b MOP = Millions of Pounds

AUM = Animal Unit Months

^c Acreages expressed represent a 1,000 foot corridor^d Assumes all of corridor removed from productivity^e Tower locations and actual vegetation affected are not known.

BL = Barren Lands

MS = Mixed Shrublands

SSS = Sagebrush-Snowberry Shrubland

AW = Aspen Woodland

DF = Douglas-fir Woodland

AG = Agricultural

Fruita I - 50,000 bpd (FI-50)

Vegetation and Productivity. The impact of the FI-50 alternative would be greater than the PA-50 or CC-50 alternatives but much less than the FI-100 alternative. The qualitative characteristics of the vegetation and productivity impacts are the same as the FI-100 alternative. However, the elimination of the open pit mine (11,095 acres) with a relatively moderate (1,400 acre) increase in the size of the spent shale disposal area would yield a significant reduction in total vegetation disturbance under the FI-50 alternative relative to the FI-100 alternative.

Wildlife. Wildlife impacts resulting from the FI-50 alternative would be reduced in magnitude and extent (as compared to FI-100) as a result of decreased surface disturbance for the PA-50 alternative. As would be the case under any of the 50,000-bpd production rate alternatives, approximately 1,400 acres of deer and elk spring transitional ranges would be affected by expansion of spent shale disposal activities on the mesa. Mitigation for the alteration of big game habitat would be the same as that proposed under the PA-100 alternative.

Endangered Species. Potential impacts on populations of candidate or listed threatened and endangered plant species would be the same as the FI-100 alternative. However, habitats of *Sullivantia hapemanii* var. *purpusii*, *Aquilegia barnebyi*, *Festuca dasyclada*, and *Thalictrum heliophilum* would not be impacted due to the absence of the open pit mine and flexibility in the siting of ancillary facilities.

Potential impacts to threatened and endangered wildlife species and their habitats would be as described for the FI-100 alternative for the Grand Valley region. Reduction in the magnitude of potential impacts to peregrine falcon habitat in the Roan Creek drainage would be the same as for other 50,000 bpd alternatives.

Fruita II - 50,000 bpd

Vegetation and Productivity. Vegetation and productivity impacts of the FII-50 alternative would be similar to the FI-50 alternative, but this alternative would involve addition of a railroad route within the Big Salt Wash and Straight Line Tunnel corridor and storage of spent shale at the Stove/Buniger canyons site rather than at the Mesa Valley Fill site. The impact on productivity would be potentially less than the FI-50 alternative since a spent shale disposal site on Clear Creek mesa is more biologically productive than a Grand Valley site. Due to the railroad, impacts to riparian and agricultural areas would be increased and the total acreage disturbed would probably be higher than any other 50,000-bpd alternative. Revegetation of the spent shale disposal site would be more difficult under this alternative and would probably require irrigation. Beyond the life of the project, a residual impact would be the lack of useful vegetation where spent shale is the soil parent material. On this longer time scale, sacrifice of the Stove/Buniger canyons site would involve less permanent productivity loss than the Mesa Valley Fill site which is proposed for the PA-50 and CC-50 alternatives.

Wildlife. Construction and operation of the proposed shale haulage railroad would result in impacts to big game movements and distribution which would likely be long term and regionally significant. The magnitude of railroad-related impacts to big game would be dependent upon the operational characteristics (e.g., speed, frequency of passage) of the railroad and the extent to which existing patterns of daily and seasonal big game movement could be maintained through mitigation. In addition to habitat loss resulting from railroad construction and operation, loss of approximately 1,352 acres of pronghorn habitat would occur if the retort and upgrading facilities were located in the Grand Valley (Table 4.8-2). The loss of an additional 400 acres of pronghorn habitat over that which would be lost under the FI-100 alternative is not considered a significant impact, since the area which would be lost does not include habitat with high primary productivity or persistent free water (both of which may limit the rate of population increase of this resident herd). An unknown quantity of elk CWR would also be impacted by the shale haulage railroad in the Brush Creek area. This alternative poses the greatest potential for regional impacts to big game movements and winter ranges. Short-term, insignificant regional impacts to local gamebird and other small game populations would be similar to those for FI-100, although somewhat greater in extent as a result of the railroad.

Habitat loss and reduction of the densities of most nongame species would be short-term impacts similar to those for FI-100. The major impact would be loss of 800 acres of raptor foraging habitat at the Grand Valley plant site and increased human disturbance near raptor nesting areas in the Book Cliffs. Potential for displacement of these nesting raptors exists within the Brush Creek area as a result of railroad construction and operation. Craig et al. (1978) documented golden eagle and prairie falcon nesting activity on the southwest aspect around Brush Creek. Based on available information, displacement of these nesting raptors from areas directly impacted by the FII-50 alternative would not be expected to influence the regional viability of these species. As previously noted, searches of all corridors associated with the FII-50 alternative have not been completed; hence, the extent of raptor impacts could be greater than described here. The Coordination Act Technical Assistance Report (USFWS 1983) discusses the extent and magnitude of these impacts in greater detail. Mitigation of wildlife impacts under the FII-50 alternative would be the same as that proposed under the PA-100 alternative.

Endangered Species. Impacts of the FII-50 alternative on endangered plant populations would be similar to those for FI-100. No additional known plant populations would be affected.

Loss of potential habitat for the black-footed ferret could be incurred through construction of the FII-50 alternative. As previously noted, this would not be anticipated to be a significant regional impact. With respect to potential impacts to peregrine falcons and bald eagles, this alternative would result in impacts similar to those described for the PA-50 alternative. A potential peregrine reintroduction and nesting location has been identified within the Brush Creek drainage (Craig et al. 1978). Although this site is not ranked as a highly suitable reintroduction site compared to other locations identified in the area (Craig et al. 1978), project-generated disturbance (shale haulage railroad) would probably preclude peregrine nesting at this site for the life of the project.

4.8.4 Alternative Siting Activities

Impacts of facility siting alternatives on vegetation are summarized in Table 4.8-5. These data provide a basis for ranking of alternatives. However, only impacts to candidate and listed threatened and endangered plant populations are considered significant.

Alternative Pipeline Corridors

Vegetation and Productivity. Acreages affected by pipeline construction and operation would be relatively small and the impact of these activities on vegetation would be insignificant. From the Clear Creek mesa point of origin, the pipeline routes to the nearby SOPS pipeline would have the lowest adverse impact, the La Sal alternative would have slightly higher adverse impact (183 acres of vegetation with moderate to high revegetation potential), and the Rangely A and B alternatives would have the highest adverse impact (254 and 282 acres, respectively) on vegetation. From the Fruita point of origin, the Fruita to SOPS alternative is shortest. The Fruita to Rangely and Fruita to Davis Point (via Big Salt Wash) alternatives would have similar impacts to vegetation, but would have much higher impacts than the Fruita to SOPS alternative. For all pipeline routes, right-of-way specifications would require threatened and endangered plant surveys and routing to avoid impacts to protected plant populations. No unavoidable impacts to threatened and endangered plants are known for any proposed route.

Wildlife. A total of 13 alternative pipeline corridors were identified for analysis (Table 2.2-1 of the DEIS). On the basis of the estimated extent of potential surface disturbance impacts on wildlife habitats, the Clear Creek mesa plant site to SOPS corridor would create the lowest level of adverse impacts to wildlife resources followed by (in order of ascending, potential adverse impact) the Rangely B, Rangely A, and Roan Creek multi-use corridors. Potential impacts of the La Sal corridor could include loss of big game spring/summer habitat and disturbance of sage grouse leks.

Four alternative product transport pipeline corridors originating from the Grand Valley plant site were identified for analysis (Table 2.2-1 of the DEIS). Comparison of these corridors was based on general knowledge of areas traversed and their length. The lowest level of impact would be expected from the SOPS corridor with relatively

Table 4.8-5 IMPACTS OF FACILITY SITING ALTERNATIVES UPON VEGETATION ACREAGE, PRODUCTIVITY, REVEGETATION POTENTIAL, AND ENDANGERED PLANT POPULATIONS

Project Components	Width of Corridor Analysis (ft)	Potentially Affected Acreage	Affected Annual Production		Duration of Impacts (S,L,R) ^a	Revegetation Potential	Endangered Plant ^b Population Occurrences	
			MOP	AUM			Listed Species	Candidate Species
Shale Disposal Locations								
Mesa Valley		1,623	0.6	333	R	Moderate to high	NS	NS
Dry Gulch		3,021	1.1	496	R	Low to moderate	NS	NS
Garvey Canyon		1,900	0.5	236	R	Low to moderate	NS	NS
Stove/Buniger Canyons		2,741	0.4	193	R	Low to moderate	NS	NS
Munger Creek		2,085	0.9	571	R	Low to moderate	NS	NS
Multiple-Use Access and Railroad Routes to Clear Creek Mesa								
Roan Creek Corridor	1,000	3,716	8.8	10,174	S,R	Low to high	X	X
Echo Lake Corridor	1,000	5,672	5.6	3,142	S,R	Low to high	NS	O
Overland Route	1,000	2,348	9.0	10,295	S,R	Low to high	O	O
Straight Line Tunnel Route	1,000	689	0.1	47	S,R	Low to high	O	O
Alternative Multiple-Use Access and Railroad Routes to the Grand Valley Plant Site								
Colorado-Ute RR Corridor	100	170	0.5	608	R	Low to high	NS	NS
Douglas Pass Road to Grand Valley Plant Site	1,000	1,088	8.1	10,066	S,R	Low to high	NS	NS
Fruita to Grand Valley Plant Site 16 Road	1,000	1,553	7.8	9,573	S,R	Low to high	NS	NS
Reservoirs								
Upper Conn Creek		2,608	11.8	13,671	R	N/A	X	X
Lower Conn Creek		2,506	9.7	10,795	R	N/A	X	X
Upper Dry Fork		2,296	10.0	11,622	R	N/A	X	X
Lower Dry Fork		2,757	10.6	12,225	R	N/A	X	X
Big Salt Wash at Garvey Gulch		210	0.2	87	R	N/A	NS	NS
Parachute Creek		2,329	9.9	10,704	R	N/A	NS	O
Pipeline Corridors								
Mesa Plant Site to SOPS Pipeline		NA	NA	NA	NA	NA	High	NS
Grand Valley Plant Site to SOPS Pipeline (syncrude)	50	38	0.1	6	S,R	Low	NS	NS
Rangely A (syncrude)	50	254	0.3	82	S,R	Low to high	NS	O
Rangely B (syncrude)	50	282	0.3	144	S,R	Low to high	NS	O
LaSal (syncrude)	50	183	0.1	251	S,R	Moderate to high	NS	NS
Buck Gulch (syncrude)	50	33	0.1	5	S,R	Low to high	NS	O
Sheep Gulch (syncrude)	50	29	0.1	5	S,R	Low to high	NS	O
Parachute Creek (water)	50	232	0.7	854	S,R	Low to high	O	O
Transmission Corridor (345 KV)								
Davis Radial		76	0.1	18	S,L	Moderate to high	NS	NS

Table 4.8-5 IMPACTS OF FACILITY SITING ALTERNATIVES UPON VEGETATION ACREAGE, PRODUCTIVITY, REVEGETATION POTENTIAL, AND ENDANGERED PLANT POPULATIONS (Continued)

Project Components	Width of Corridor Analysis (ft)	Potentially Affected Acreage	Affected Annual Production		Duration of Impacts (S,L,R) ^a	Revegetation Potential	Endangered Plant ^b Population Occurrences	
			MOP	AUM			Listed Species	Candidate Species

^a S = Short term; L = Long term; R = Residual.

^b Occurrence:

x = verified populations affected

O = possibly present based upon habitat suitability

NS = preliminary study negative, mitigation will include field search prior to construction

greater impacts followed (in order of ascending potential adverse impact) by the La Sal corridor, Rangely B, and Rangely A routes. According to the Technical Assistance Report (USFWS 1983), the Rangely A corridor is preferred over the Rangely B. The ranking is weighted toward the relative impacts of each corridor on plant species of concern and is less affected by the relative impacts of each corridor on wildlife and wildlife habitats.

Three intertie pipeline routes were identified for analysis: Big Salt Wash, Deer Creek, and Overland. The Big Salt Wash route traverses a significant amount of riparian habitat (2,624 acres) in addition to elk winter range. The Deer Creek and Overland routes traverse deer and elk winter range and elk CWR. The Overland route was judged to have the least potential for adverse impacts, with the Deer Creek and the Big Salt Wash routes having a greater level of potential impact.

Four water pipeline alternatives were identified for analysis: the 16 Road pipeline (multi-use corridor), the Roan Creek pipeline (multi-use corridor), the Parachute Creek water pipeline corridor, and the Loma intake to 16 Road water pipeline corridor. Additionally, four subalternate water pipeline corridors connecting the Loma intake with the 16 Road water pipeline have been identified. Available data suggest that pipeline corridor impacts would be minimal.

The Coordination Act Technical Assistance Report (USFWS 1983) and the BLM Biological Assessment (BLM 1983c) provide additional detail concerning potential impacts of these routes. Mitigation measures for the impacts described above would be the same as those described for the PA-100 alternative.

Alternative Water Intake Locations

Vegetation. The alternative intake diversion locations would probably have an insignificant impact on vegetation productivity. However, because wetlands would potentially be affected, the sites should be surveyed to ascertain the degree of impact to wetlands.

Wildlife. Wintering bald eagles are common in the vicinities of all alternative intake locations; however, levels of eagle winter use at these sites are below that identified within areas of concentrated eagle use (Fisher et al. 1981). The Parachute and De Beque intake locations are not located close to established eagle roost sites; however, the Loma "B" alternative lies within 0.5 air mile of a roost. Impacts resulting from construction, operation, and maintenance of intakes at any of these locations would be determined by levels of human activity and canopy cover at each site (Stalmaster and Newman 1978). Mitigation for impacts to bald eagles would be the same as that proposed for raptors under the PA-100 alternative.

Alternative Reservoir Sites

Vegetation and Productivity. Vegetation productivity impacted by construction of any of the four Roan Creek reservoirs would be similar. However, the alternative reservoir sites would differentially impact populations of candidate or listed threatened or endangered plant species. Impacts of the Upper Dry Fork reservoir have been previously discussed. The Lower Dry Fork reservoir would have the least impact to endangered plants of the alternative reservoirs. However, even the Lower Dry Fork site would inundate one large population of the Uinta Basin hookless cactus and one population of *Phacelia submutica*. The Lower Dry Fork site would allow construction of corridors on the east side of the reservoir without additional impact to endangered plant species. The Upper and Lower Conn Creek sites would be similar to one another in impact to endangered plant populations and are intermediate in impact to such populations with respect to the Upper and Lower Dry Fork sites. The Upper and Lower Conn Creek sites would inundate one large and two small populations of the Uinta Basin hookless cactus and would involve further impacts to another large population on the access corridor east of the reservoir. The Upper and Lower Conn Creek alternative would also inundate four known populations of *Phacelia submutica*.

Wildlife. Construction and operation of the Upper Dry Fork reservoir would result in significant regional impacts resulting from inundation of 202 acres of deer CWR. Impacts would include inundation of about 210 acres of CWR for the Big Salt Wash reservoir, 325 acres at the Lower Conn Creek site, 379 acres at the Upper

Conn Creek site, and 234 acres at the Lower Dry Fork site. The acreage of CWR which could be inundated by the Parachute Creek reservoir alternative is unknown. Mitigation of these impacts would be accomplished through measures proposed by the Operator for the PA-100 alternative.

Alternative Multi-use Access and Railroad Corridors

Vegetation. The Roan Creek, 16 Road, and Dorchester Coal railroad corridors traverse agricultural lands and would impact the productivity of these areas. However, the Dorchester Coal alternative would support other projects and CCSOP use of the route would not add to the vegetation impacts of construction of this railroad route. Of the various railroad corridors under consideration, only the Roan Creek route would potentially impact listed and candidate threatened and endangered plants. Impacts to populations of these plant species could possibly be avoided in routing the railroad within the Roan Creek corridor.

Wildlife. Due to its length and position relative to riparian habitat and CWR, project construction and operation activities in the Roan Creek corridor could result in locally significant impacts to wildlife. Truck and train traffic levels projected by the Operator (Chevron 1983b) to meet operational needs for coal and limestone may effectively preclude use by most wildlife species in this corridor and a buffer zone surrounding it. The 16 Road corridor would have lower adverse impacts due to the extent of big game (antelope) winter range and other sensitive habitat types present. Potential impacts to wildlife resources from the Douglas Pass Road corridor would be similar in nature and magnitude to those of the 16 Road multi-use corridor. The potential for the occurrence of white-tailed prairie dog towns (potential habitat for endangered black-footed ferret) exists within the Dorchester Coal corridor; hence, negative impacts to potential black-footed ferret habitat could occur along this route.

Potential impacts of railroad construction and operation were studied for two alternative shale transport railroad corridors which could be incorporated in the FII-50 alternative. Specific baseline data concerning construction-related impacts to the two tunnel route alternatives were not available; however, the following judgments were made based upon regional information and general knowledge of the area. While the Straight Line Tunnel route would have less potential for surface disturbance and related wildlife habitat impacts, it would transect critical elk winter range in Brush Creek and other presently undisturbed areas. By contrast, the Roan Creek tunnel route would parallel the existing Roan Creek Road before joining the proposed Roan Creek multi-use corridor near the confluence of Roan Creek and Clear Creek. Either of these alternatives would generate moderately adverse impacts to wildlife in the project area resulting primarily from habitat loss and noise. Committed mitigation which would alleviate impacts to wildlife as a result of construction and operation of access and railroad corridors is the same as that proposed for wildlife impacts on the PA-100 alternative.

Spent Shale Disposal Alternatives

Vegetation. Of the four alternative spent shale disposal sites, the Dry Gulch site would potentially impact the greatest amount of vegetation (3,021 acres). No agricultural lands would be affected. The remaining alternative spent shale disposal sites, Garvey Canyon, Stove/Buniger canyons, and Munger Creek, would affect up to 1,900, 2,741, and 2,085 acres, respectively of native vegetation. No agricultural land would be affected by these alternative sites. The Munger Creek site has the highest annual plant productivity and the Stove/Buniger canyons site has the lowest productivity based on worst-case estimates. No known populations of special concern plant species would be impacted by the four alternative sites. Insignificant adverse impacts to vegetation would result from the selection of any of the four alternative spent shale disposal sites.

Wildlife. All four spent shale disposal sites include either mule deer critical winter range, active raptor nest sites, or both. The Dry Gulch site includes two active golden eagle nests, one active prairie falcon nest, and an unknown acreage of critical winter range for mule deer. The Garvey Canyon site also includes two active golden eagle nests, and an unknown acreage of CWR. It is likely that active raptor nest sites and mule deer CWR would also be encountered at the Stove/Buniger canyons and Munger Creek sites. Mitigation of these impacts would be the same as that proposed for the PA-100 alternative.

4.8.5 Transportation Alternatives

Vegetation

Site-specific adverse impacts to vegetation and annual productivity would result from truck or rail transport of coal due to the permanent elimination of vegetation along the corridor route. Low adverse impacts to vegetation could result from fugitive dust coating plants adjacent to the corridor which could result in reduced photosynthesis and annual productivity.

Wildlife

Of the alternatives under study, trucking of coal to the retort-upgrading facilities at the Clear Creek mesa or Fruita plant sites would result in the most significant adverse impacts to wildlife due to increased road kills. Rail transport would result in greater operational noise, but disturbance would be more predictable and less frequent than that generated by trucking coal.

Potential impacts of truck transport of coal within the Clear Creek access corridor were judged to be moderately severe and of regional significance. Passage of 90 haul trucks per day would limit most wildlife use in areas impacted by the resultant noise. In addition, this schedule of operation would undoubtedly result in permanent alteration of big game movement and range use patterns throughout the Roan Creek drainage (Unit 31). Construction of a railroad for materials transport within the Roan Creek corridor would result in loss of an unknown quantity of riparian habitat. Operational impacts of one unit train (required for coal transport) making one round trip per day along this route would be moderate in comparison to those resulting from the truck transport alternative.

Mass transit of workers would result in less road kill of wildlife and would reduce the potential for harassment which could be associated with transportation by means of personal vehicles. The Operator is committed to reducing the likelihood and frequency of roadkills; mitigation is the same as that proposed for the PA-100 alternative.

4.8.6 Solid and Hazardous Waste Disposal

On-site solid waste disposal would minimize the potential for vegetation removal and wildlife habitat loss or road kills elsewhere and is, therefore, preferred. On-site hazardous waste disposal would be preferred to off-site disposal for the same reasons.

4.8.7 Secondary Impacts

Vegetation

Secondary impacts to vegetation and productivity would occur as a result of the construction of permanent housing, roadways, and numerous other facilities which would be required to support an induced population of approximately 28,000. Preliminary assessments suggest that several square miles of agricultural lands (mostly in the Grand Valley) could be converted to other uses, resulting in permanent losses of productivity.

Wildlife

Indirect loss of wildlife and wildlife habitat would result from secondary impacts of the proposed project. A long-term reduction of wildlife densities from road kills and poaching could occur throughout the region. Direct loss of wildlife due to poaching could be locally significant, especially for deer and pronghorn, where concentration areas are accessible. Direct regional impacts on wildlife habitat would result from housing and community infrastructure development. The magnitude of long-term reduction in the regional carrying capacity for many species would be minimized if such habitat losses are concentrated in areas of existing community development. Indirect impacts to wildlife would occur as a result of increased levels of noise, harassment by

domestic pets, and human activity (including ORV use) in the area of secondary impact. A simultaneous increase in the demand for consumptive and nonconsumptive wildlife-related recreation would occur throughout the area. The Operator proposes to prohibit public access to critical wildlife habitats under CCSOP control without consultation with CDOW and USFWS. In addition, the Operator would contribute to consultation, organization, and development of a regional wildlife management plan, as appropriate, in a cooperatively funded venture with CDOW and USFWS.

4.14 Cumulative Impacts

4.14.1 Introduction

Cumulative environmental impacts are those which result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of party or parties responsible for such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ 1978: 1508.7).

The cumulative impacts, as presented in this section, consider the area of impact (e.g., society as a whole, affected region, local area) and the intensity (significance) of impact (e.g., effect on public health and safety; effect on unique areas). A "significant" impact was defined as an impact creating a situation that violates a standard, results in the irrevocable loss of a natural resource (including a species or habitat supporting a species), or has serious legal connotations (e.g., affecting water or property rights). Slightly different significance criteria were considered for each discipline in the cumulative impact analysis.

The discussion of cumulative impacts presented herein represents the best possible analysis of the projects proposed or present within the region at this time. Considering the fluctuating and uncertain nature of many of the projects, incorporation of valid quantified information is, for the most part, not possible.

As discussed in Section 1.6 of the DEIS, this EIS addresses cumulative impacts of projects in the region of the CCSOP that (1) currently exist, (2) are currently being constructed, or (3) have a substantial commitment of resources at this time (\$100 million dollars or more as of September 1982). These criteria were established by BLM early in the EIS process and are consistent with criteria used for the work performed by the Cumulative Impact Task Force (CITF). Those projects that meet any of these criteria are shown on Figure 4.14-1 and have been considered in the cumulative analysis of each discipline, as applicable. Additional projects were considered for air quality cumulative impact analysis; these are also shown on Figure 4.14-1.

The cumulative impacts for the CCSOP have been addressed for all disciplines in the same order as in Chapters 3.0 and 4.0.

4.14.2 Air Quality and Meteorology

Cumulative air quality impacts would result from the proposed CCSOP and other sources in the region. Issues include compliance with Prevention of Significant Deterioration (PSD) increments for sulfur dioxide (SO_2) and total suspended particulates (TSP), Colorado Category I increments for SO_2 , National Ambient Air Quality Standards (NAAQS), and State of Colorado Ambient Air Quality Standards for SO_2 , TSP, nitrogen oxides (NO_x), and carbon monoxide (CO). Impacts to visibility within the area were also considered. Additional information on these matters is available in the *Draft Supplemental EIS on the Prototype Oil Shale Leasing Program* and the appropriate amendments (BLM 1982b, BLM 1982k, BLM 1983a).

Background concentrations of CO, lead, NO_x , hydrocarbons, ozone, SO_2 , TSP, and T_{10} (respirable particles less than 15 microns in diameter) are usually near or below the measurable limits (BLM 1982b). Exceptions are short-term concentrations of TSP (probably related to windblown fugitive dust), and ozone, possibly related to long-range transport from urban areas and/or to photochemical reactions with natural hydrocarbons. Impacts due to construction were not considered, due to the short-term nature and low percentage relative to operations.

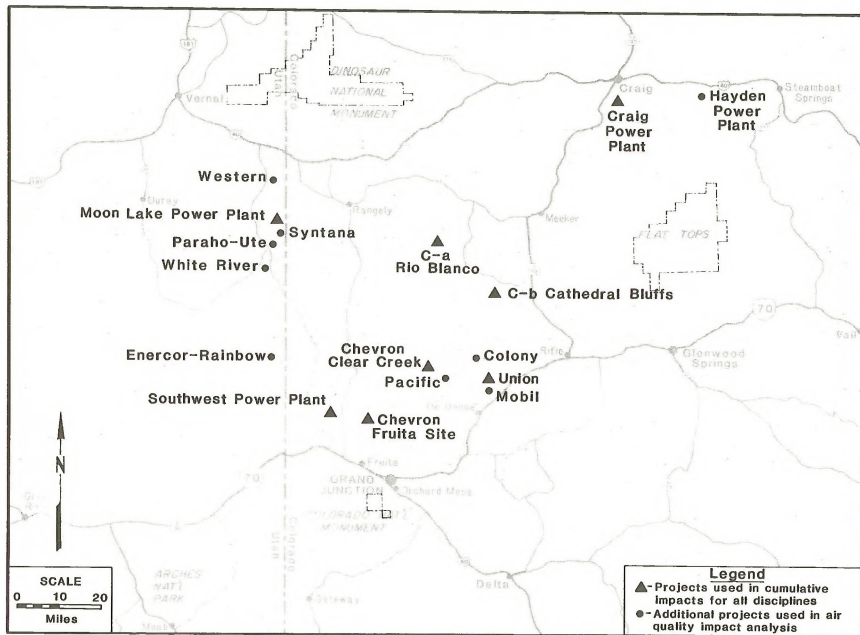


Figure 4.14-1 New Projects Assumed for Cumulative Impact Analysis.

To determine the contribution of additional industrial developments to air quality impacts in the region, pollutant concentrations were estimated by BLM (1982b) using the Topographic Air Pollution Analysis System (TAPAS). This system, comprised of several air quality computer models, predicts the resulting ground level concentrations by taking into account topography, ground cover, and meteorology as well as industrial plant emission characteristics (Dietrich et al. 1982).

Figure 4.14-1 shows the region modeled, new emission sources, and sensitive receptor locations. Table 4.14-1 lists the emission totals for sources located in Figure 4.14-1, including the Chevron retort and upgrade for the PA-100/CC-100 configuration. Due to the general, preliminary nature of many of the sources shown on this figure, specific development details are lacking. Therefore, air pollutant impacts were modeled conservatively and generically. A worst-case analysis was performed.

Table 4.14-2 summarizes the ranges of maximum 24-hour predicted concentrations at various receptor areas for TSP, SO₂, and NO_x from major emitting facilities in 2003, including various CCSOP alternatives. The upper range assumes a 24-hour meteorologically persistent condition while the lower range assumes less conservative 10-hour meteorological conditions. The highest concentrations are predicted in the Mt. Zirkel Wilderness Area with SO₂ impacts ranging from 6 to 15 µg/m³. The high range for Category I SO₂ increment would be consumed in Dinosaur National Monument. The PSD Class II areas of Roan Cliffs and the Grand Hogback would exceed TSP increment for the low and high ranges, and consume the SO₂ increment in the high range.

Emissions from the CCSOP upgrading facility in the Grand Valley (Fruita alternatives) will be very low in Arches National Monument, and thus will not aggravate acid deposition in Arches National Monument to a significant extent. Lewis and Grant (1981) indicate that, although it is not known how individual sources contribute to western acid deposition, it is unlikely that single sources provide more than a minimal contribution. Because the Flat Tops Wilderness is located more than 56 miles from the upgrading plant, and because occurrence of meteorological conditions necessary to transport pollutants to the wilderness area would be rare, adverse impacts due to acid deposition are not likely.

A study of the acid deposition flux was performed for the FI-100 configuration using ERT's Source Depletion Model (Chevron 1982e). Six sources were considered:

- CCSOP — 100,000 bpd retorting at Clear Creek
- Rio Blanco — Lurgi Demonstration Project
- Cathedral Bluffs — 5,000 bpd MIS facility at Tract C-b
- Colony and Union — 46,000 bpd and 10,000 bpd, respectively
- CCSOP — 100,000 bpd upgrading in Grand Valley
- Uinta Basin — Moonlake Power Plant (800 MW), TOSCO (46,000 bpd), White River (106,000 bpd), and Paraho-Ute (42,000 bpd)

Impacts from the deposition were evaluated for Ned Wilson Lake in the Flat Tops. This lake was identified as having little buffering potential (Turk and Adams 1982) and hence, is particularly susceptible to damage from acid rain. The predicted pH change is -0.16 (Chevron 1982y). This value would yield a new pH in the lake of 6.60. Since no threshold of critical pH levels for aquatic species has been established, it is not known what effect this small shift in pH will have on the biota.

Cumulative secondary impacts due to population growth would affect air quality. Corresponding emission rates could be estimated using the percent contribution (Table 4.14-3) of direct and indirect emission rates related to oil shale development (PEDCo 1982). Applying the percent contributions of the production years 1990 and 2000 to the individual source, emission rates that are presented can then be used to interpret potential air quality emission due to secondary sources.

Table 4.14-1 TOTAL EMISSION ASSUMPTIONS FOR MODELED POINT SOURCES (g/sec)^a

Source	1993 Low ^b			1993 High ^b			2003 Low ^b			2003 High ^b		
	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x
Colorado Synfuel												
Cathedral Bluffs	0	0	0	19	42	172	19	42	172	67	153	621
Chevron-retort-upgrade	0	0	0	77	51	516	77	51	516	154	101	1,031
Colony	34	40	220	34	40	220	34	40	220	34	40	220
Mobil	0	0	0	0	0	0	0	0	0	50	66	194
Rio Blanco	0	0	0	39	14	117	39	14	117	78	28	233
Pacific Union	0	0	0	0	0	0	0	0	0	10	44	22
	10	13	39	50	66	194	50	66	194	90	120	350
Colorado Power Plants												
Craig	90	371	742	90	371	742	90	371	742	90	371	742
Hayden	23	348	245	23	348	245	23	348	245	23	348	245
Southwest	15	131	291	15	131	291	15	131	291	15	131	291
Utah Synfuel												
Enercor-Rainbow	4	3	3	4	3	3	4	3	3	4	3	3
Paraho-Ute	0	0	0	6	12	32	6	12	32	27	50	134
Syntana	0	0	0	11	11	62	11	11	62	36	36	206
Western	6	3	3	6	3	3	6	3	3	6	3	3
White River	8	6	34	27	19	115	27	19	115	55	38	230
Utah Power Plant												
Moonlake	31	53	562	31	53	562	31	53	562	31	53	562

Source: Dietrich et al. (1982b).

^a Modeled emissions for varying stack heights appear in the supplemental impact analysis technical report (Dietrich et al. 1982b).^b High and low scenarios relate to the production rates as defined in Draft EIS for the Prototype Oil Shale Leasing Program and appropriate amendments (BLM 1982b,k and 1983a).

The resulting emission values indicate a relative potential impact to air quality, especially total suspended particulates. As shown in Table 4.14-3, particulates directly attributable to oil shale development make a small contribution (less than 20 percent of the total) to the total air quality emissions. The increased secondary emissions of TSP from additional vehicles on unpaved roads and wood fires would contribute over 80 percent to the overall emissions. Gaseous emissions of SO₂ and NO_x from residential heating and combustion engines, however, would have only a slight adverse effect when compared to the various oil shale point sources.

It would be inappropriate to model emission data which is proportioned in this manner, due to the other inadequate input. Nevertheless, because of the potential for growth related large TSP concentration, local planning organizations will need to carefully manage growth, especially in the event that several oil shale projects should start concurrently.

4.14.3 Noise

Cumulative noise impacts are expected to be minimal since oil shale and other energy projects are generally located in remote locations. As such, the attenuation of noise generated at any of the sites will be great enough to minimize noise impacts to receptors. Some displacement of wildlife may occur due to noise generation, especially during peak periods (e.g., blasting).

The most noticeable cumulative noise impact will be due to the increased amount of vehicular traffic. The traffic increase will, however, be concentrated in specified corridors, thereby localizing the impacts.

4.14.4 Water Resources

Surface Water

The cumulative impact of withdrawal of large quantities of water from the Colorado River system for development activities can be expected to result in stream flow depletion for the Colorado River, especially during low flow periods. The CCSOP by itself is projected to have an ultimate annual water withdrawal of approximately 24,000 acre-feet from the Colorado River. The water use for each of the GCC members is shown in Table 2.3-9A (Section 5.3.5 of the FEIS). When taken in conjunction with these other withdrawals for the GCC Roan Creek reservoir, the Colorado River stream flow depletion at De Beque would amount to 10 percent of the mean annual flow if the maximum amounts of water are withdrawn. Salinity of the Colorado River would increase to some extent for average flow conditions due to this water withdrawal. The cumulative impacts on water quantity and quality due to water withdrawals by this and other projects from the Colorado River would affect present and future water users.

Similarly, cumulative water withdrawals would impact the available share of water consumption for Colorado. Based on the 1979 depletions in Colorado of 1,785,000 acre-feet, the remaining water available for Colorado

Table 4.14-2 MAXIMUM 24 HOUR PREDICTED POLLUTANT CONCENTRATION RANGES
(micrograms/cubic meter), 2003 HIGH LEVEL SCENARIO^a

	PA 100			PA 50			FI 100		
	CC 100			CC 50					
Sensitive Areas	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x
Class I Areas									
Flat Tops	6- 14 ^b	5- 12 ^b	24- 57	5- 12 ^b	5- 11 ^b	19- 46	6- 13 ^b	5- 12 ^b	23- 55
Mt. Zirkel ^c	0- 1	6- 15 ^b	4- 11	0- 1	6- 15 ^b	4- 11	0- 1	6- 15 ^b	4- 11
Category I Areas									
Dinosaur Natl Monument	2- 5	2- 6 ^d	15- 36	2- 5	2- 6 ^d	15- 36	2- 5	2- 6 ^d	15- 36
Class II Areas									
Roan Cliffs	143-343 ^e	45-108 ^e	312-749	143-343 ^e	45-108 ^e	312-749	143-344 ^e	45-109 ^e	313-752
Grand Hogback	52-124 ^e	39- 94 ^e	141-339	52-124 ^e	39- 94 ^e	141-339	42-124 ^e	40- 95 ^e	145-347
PSD Increments									
Class I	10	5	-	10	5	-	10	5	-
Class II	27	91	-	37	91	-	37	91	-

Table 4.14-2 MAXIMUM 24 HOUR PREDICTED POLLUTANT CONCENTRATION RANGES
(micrograms/cubic meter), 2003 HIGH LEVEL SCENARIO^a

Sensitive Areas	FI 50			FII 50			No Action		
	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x	TSP	SO ₂	NO _x
Class I Areas									
Flat Tops Mt. Zirkel ^f	5- 11 ^b 0- 1	4- 11 ^b 6- 15 ^b	19- 45 4- 11	4- 11 ^b 0- 1	4- 10 ^b 6- 15 ^b	16- 37 4- 11	4- 10 ^b 0- 1	4- 10 ^b 6- 15 ^b	14- 35 4- 11
Category I Areas									
Dinosaur Natl Monument	2- 5	2- 6 ^d	15- 36	2- 5	2- 6 ^d	15- 36	2- 5	2- 6 ^d	15- 36
Class II Areas									
Roan Cliffs Grand Hogback	143-343 ^e 52-124 ^c	45-109 39- 95 ^e	313-750 143-343	143-344 ^e 53-127 ^c	46-109 ^e 40- 94 ^c	316-758 152-339	143-343 ^e 52-124 ^c	45-108 ^e 39- 94 ^c	312-749 141-339
PSD Increments									
Class I	10	5	-	10	5	-	10	5	-
Class II	37	91	-	37	91	-	37	91	-

Source: Dietrich et al. (1982b).

^a High level scenario defined in the Final EIS for the Prototype Oil Shale Leasing Program and appropriate amendments (BLM 1983c) plus the proposed Southwest Power Plant at 300 megawatt capacity. Values represent modeled point source contributions (i.e., exclusive of existing background).

^b Value exceeds PSD Class I increments.

^c For Mt. Zirkel Wilderness SO₂ values, the entire modeled level is due to a pre-PSD, nonincrement consuming source.

^d Value exceeds Colorado Category I increments.

^e Value exceeds PSD Class II increments.

(according to the Upper Colorado River Compact of 1948) would be 1,191,000 acre-feet. Water withdrawal for the CCSOP is projected to constitute an additional 2.1 percent of the available share of consumption for Colorado. Under appropriate economic conditions, other oil shale development could be expected to increase considerably, and demand substantially more water from the Upper Colorado River system. As much as 955,000 acre-feet of water has already been committed to future use in Colorado through various planned and authorized water projects (BLM 1975).

Development of other energy projects within the region could result in increases in the likelihood of oil and chemical spills, with concomitant impacts on surface waters. Localized heavy rainfalls (1 to 2 inches per hour) could present problems in the maintenance of environmental pollution control structures. Additionally, the cumulative development of multiple energy projects with the associated hydrographic modifications (e.g., impoundments, diversions, streambed alterations) could impact the movement, flow, and circulation of surface waters.

It is anticipated, however, that if compliance with state and federal laws is assured (notably water laws and mined land reclamation laws), cumulative impacts to the surface water resources will be within acceptable limits (CDOH 1983).

Table 4.14-3 PERCENT CONTRIBUTION OF DIRECT AND INDIRECT EMISSIONS RELATED TO THE OIL SHALE DEVELOPMENT

	Percent Contribution Direct	Indirect
Total Suspended Particulates		
1990	15.1	84.9
2000	19.4	80.6
Sulfur Dioxide		
1990	96.3	3.7
2000	96.7	3.3
Oxides of Nitrogen		
1990	92.4	7.6
2000	94.4	5.6

Source: PEDCo (1982).

Ground Water

Cumulative impacts to ground water are not expected to be significant. Due to the hydraulic isolation of the CCSOP and other oil shale properties, significant cumulative impacts are not anticipated. Potentially important regional aquifers above and below the oil shale zone were not encountered on Clear Creek mesa nor at the alternative Grand Valley site. Proposed and alternative pipeline corridors should not affect these water-bearing bedrock units.

Localized cumulative impacts to ground water may result, should additional oil shale development occur immediately adjacent to the Clear Creek site. Such impacts would be to water quality and quantity (dewatering).

As discussed in Section 4.4.2, some increases in total dissolved solids (TDS) may occur as a result of mining and spent shale disposal. Given that mining and disposal would not directly disturb important regional aquifers (Upper and Lower Parachute Creek Aquifers, and alluvial systems), impacts to regional water quality should be negligible.

Dewatering impacts to regional bedrock aquifers are not expected. Locally, the proposed well field system to pump water from Clear Creek alluvium would reduce water levels in this aquifer. A decrease in the saturated thickness of the alluvial aquifer may result in water level decreases in the range of 7 to 20 feet. This decline could be accelerated if additional withdrawal occurs to support any adjacent oil shale development.

Other potential cumulative impacts to ground water include contaminant migration due to improperly lined containment ponds, as well as leachate migration from spent shale piles. However, due to the relative hydrologic isolation of project sites, these impacts are not expected to be significant.

4.14.5 Topography, Geology, and Paleontology

Topography

Cumulative impacts to topography in the region would occur from construction activities, infrastructure development, and associated land use changes. Compared to the topographic features of the entire area (Figure 4.14-1), any changes to the topography due to the projects under consideration would be minimal, and therefore insignificant. In the case of CCSOP mining operations, proper reclamation techniques would further reduce any impact to the region's topography.

Geology

Cumulative geologic impacts associated with development of the CCSOP and other projects in the area would consist of both increased energy consumption and production. The development of shale oil as an energy source would result in a permanent loss of this energy resource, but would provide energy to the region and nation. For project development and related infrastructure development, additional energy sources (coal, oil, and gas), as well as construction-related minerals (sand and gravel, building stones, and clay) would be required and permanently committed to the various projects. Due to increased development pressures from both direct project development and secondary development (e.g., housing), potential damage from landslides, debris flows, and rockfalls is increased.

Paleontology

Cumulative impacts to paleontological resources within the region would include increased access to remote areas and potential exposure of fossil-bearing strata during construction and operational activities. Significant cumulative impacts to paleontological resources are not predicted at this time.

4.14.6 Soils

The cumulative impacts of development on the soil resources of the region would be most significant (in terms of productivity lost) when considering prime farmland soils. It is estimated that some prime farmland acreage would be lost, mostly as a result of secondary development activities. Additionally, wind and water erosion during the construction of housing and community facilities may result until proper stabilization has occurred. Soil compaction may occur at both the site of project development as well as areas of secondary development. Losses to soil productivity would occur due to project construction and operational activities for each of the alternatives considered. In some instances (e.g., surface mining), such productivity loss would be large in terms of acreage, but take place on relatively unproductive (i.e., rangeland) soils. Additionally, the productivity loss on these soils would be temporary and would be restored upon reclamation. In other instances (e.g., residential development), lost acreage would be much smaller but the loss would be permanent.

Acid rain would affect soil properties such as pH, electrical conductivity, and sodium content. The actual impact upon these soils, which typically have a pH in excess of 7.4 (except at some of the higher elevations of the project area), is expected to be minimal because of the buffering capacity.

Potential cumulative wind erosion impacts on adjacent undisturbed land up to 100 yards away from disturbed areas would be minimal compared to the total acreages of cropland or rangeland that exist in the Piceance Basin.

4.14.7 Aquatic Ecology

The most significant cumulative impacts to the aquatic resources are likely to be those associated with water depletions due to intake diversions and secondary growth. The amount of water proposed to be depleted from the upper Colorado River system by other industrial projects and various trans-basin diversions leave little doubt that the native fishes, especially the endangered forms, could be seriously impacted in the future. Critical flows for the endangered fish (Table 4.7-3) have already been exceeded for some months (Table 4.7-4), and the CCSOP and GCC could reduce flows in other months so they are closer to the critical flows.

Additional pressures and resulting impacts on the recreational fisheries resources can also be expected due to the increased population. The CCSOP accounts for about 50 percent of population growth in the region which is expected over the life of the project (see Section 4.12 of the DEIS). Thus, the magnitude of the secondary impacts described in Section 4.7 will be considerably greater in a cumulative sense than would be the case if only the CCSOP was considered.

4.14.8 Terrestrial Ecology

Vegetation

The development of oil shale and other energy projects has and will occur on rangeland areas (CDOH 1983). Hence, the cumulative impacts on the vegetation types of the region will be generally insignificant. The exception is development of agricultural lands along the Colorado River and its tributaries. Agricultural productivity would be affected due to off-site developments that would be concentrated along the major transportation routes which, in this area, are agricultural valley bottoms. Long-term and residual impacts may be anticipated with respect to the roles that vegetation plays in regional ecosystem productivity and carrying capacity for livestock and wildlife, ecosystem structure, and processes such as soil development. However, proper reclamation techniques will minimize any such impacts.

The CCSOP may affect three plant species of concern: (1) sedge fescue (*Festuca dasyclada*), (2) De Beque phacelia (*Phacelia submutica*), and (3) Uinta Basin hookless cactus (*Sclerocactus glaucus*) (BLM 1983c). However, impact to these species can be mitigated and cumulative impacts to threatened and endangered plants are not expected to be significant on a regional basis. A study of these impacts, including a field data acquisition effort, is presently in progress under the direction of the Colorado Department of Natural Resources.

Wildlife

Cumulative effects of development in this area may reduce regional carrying capacity for most wildlife; however, wildlife species composition should not change significantly within direct areas of impact. Widespread displacement of wildlife to adjacent, less impacted areas of their range and modification of their movements and seasonal patterns of habitat use are likely. Big game abundance may be reduced in response to increased levels of human activity, including operational noise, off-road vehicle use, poaching, and harassment on winter ranges and during critical periods such as fawning and calving. Increased regional demand for hunting and other wildlife recreation opportunities would result in increased hunting pressure and harvest. Consequently, the demand for specific types of wildlife-related recreation may not be met.

Cumulative impacts to endangered wildlife species are not expected to be significant on a regional basis. Although the potential for mitigation through siting and activity buffer zones exists, the practicality and potential effectiveness of these measures are difficult to assess over the life of the CCSOP, during which time a significant amount of energy and related project development is planned.

Prairie dog towns which could support black-footed ferrets could be directly and indirectly affected by industrial and community development. Also, bald eagle use of riparian habitats along the Colorado River may be reduced in response to significantly increased levels of human activity and harassment. Compression of the present winter range of this species from Parachute to Fruita may result in a decline in the number of bald eagles in the region. Recent studies (BLM 1983c) have indicated that there will be no effect to either of these species from the CCSOP.

Finally, loss of peregrine falcon hunting habitat and potential nest sites may restrict the potential success of future reintroduction efforts in this area. As concentrated oil shale development occurs in the vicinity, increased levels of human disturbance, habitat loss, and operational noise may preclude the peregrine falcon from this area. Again, the recent study above suggests, however, that no effect to this species will occur specifically from CCSOP development.

The Colorado Division of Wildlife, the U.S. Fish and Wildlife Service, and the Bureau of Land Management are currently developing the information base and capability to predict more precisely the cumulative impacts of energy development on wildlife (CDOH 1983).

4.14.9 Visual Resources

Cumulative effects of development in the region would result in alteration of the visual setting of the region. Construction of several large-scale energy resource, mineral, and industrial development projects would alter the existing landscape and pose sharp contrasts within the rural character of the region. The aesthetic experience of visitors and residents in the region would be permanently altered.

4.14.10 Cultural Resources

Cumulative impacts to the cultural resources within the region from increased natural resource development may be significant. Impacts resulting from physical construction of energy, mineral, and industrial development can be mitigated according to provisions of 36 CFR 800. Problems arise, however, as a result of increased populations in the area in conjunction with improved access to previously undisturbed remote areas. Increased vandalism and unauthorized collecting associated with recreational activity and other pursuits may occur. The potential exists for inadvertent destruction of unknown sites which have not previously been recorded, as well as purposeful destruction of known sites.

4.14.11 Land Use, Recreation, and Wilderness

Changes in regional land use patterns, recreation, and wilderness use would result due to the cumulative effects of several large-scale projects. Populations relocating to the area would demand that new housing and community services and facilities be developed, creating changes in current land use patterns. Increased numbers of people would create increased demands for recreational and wilderness opportunities. Developed recreational sites would receive additional use, possibly overloading capacities, or stimulating expansion.

Perhaps the most significant cumulative effect, however, would be changes in current land use patterns, particularly in areas along valley floors. The region in and adjacent to impacted communities would begin to exhibit characteristics of urbanization: increased population densities, greater numbers of residential and commercial structures, and increased traffic. Urban functions would encroach upon what is now predominantly rural, open space, and irrigated and nonirrigated cropland. If oil shale development is low to moderate (180,000 to 530,000 barrels per day) there should be sufficient land presently available to accommodate projected growth without significantly impacting agriculture (CDOH 1983). However, if there is additional development, impacts will become more significant.

An area of concern for assessing cumulative impacts is the purchase of agricultural water rights by oil shale companies. While such a purchase would not directly affect the extent of agricultural land, it would decrease the amount of water available for irrigation, hence reducing agricultural productivity.

4.14.12 Socioeconomics

It should first be noted that socioeconomic impacts in this EIS were analyzed as cumulative impacts. The impacts of the CCSOP were evaluated in addition to those of other potential projects. With this approach in mind, the following additional background discussion of cumulative socioeconomic impacts is appropriate.

Construction and operation of several natural resource and energy-related projects within the region would create a number of cumulative social and economic impacts. It is anticipated that, with enhanced development, population levels in the region would increase dramatically by the year 2000. Growth associated with industrial development would bring with it opportunities and potential problems.

Employment opportunities within the region would increase due to construction and operation of several projects simultaneously. Significant increases in the non-local population base would occur. The region's economic structure would inevitably become more dependent on mining and construction activities. Total personal income would grow significantly, primarily because of high annual earnings projected for energy-related workers accompanied by increased local spending and economic activity. Increased competition for workers among economic sectors, particularly agriculture, would take place as a consequence of increased development.

Social impacts within the region would occur at rates equivalent to increases in populations. The kinds of problems occurring would most likely be those commensurate with the lifestyles of single-status construction personnel. Rural areas of the region would be more directly impacted than urban centers. The loss of rural lifestyles, which has been occurring for over a decade, would also continue. Increased population and congestion would confront area residents over the next several decades. However, social diversity would be enhanced with the CCSOP and other projects.

The service and capacity thresholds for many communities have already been reached, and several of these communities have carried out planning processes, explored financing options, scheduled or built facilities, or instituted new programs to meet service demands. The addition of new populations beyond those resulting from the CCSOP would accelerate this changing situation and create a number of demands on both existing and planned structures. This would be particularly evident in the case of water and sewer systems, and local school systems. However, a number of communities' service facilities have been designed to accommodate population levels that would be associated with several projects of the magnitude of the CCSOP (e.g., Ute Water Conservation District and Battlement Mesa Inc.).

The housing construction industry should be able to meet increased housing demand brought about by several simultaneous projects. The industry may require incentives to build speculative housing because of uncertainties created by previous energy industry delays and shutdowns within the region. The affordability of housing would remain a regional concern for low and middle income groups, including seniors.

Financial effects of projected growth on local governments would probably be most positive for the counties which would benefit from direct increases in their tax bases from the projects. Smaller municipalities, who have not expanded for growth, could possibly have financial difficulties stemming from capital expenditures which have already been planned, mostly to correct existing deficiencies.

4.14.13 Energy and Transportation

Energy

The cumulative impacts on the area's energy balance would result from increased consumption and increased production. The net effect of most reasonably foreseeable future actions (e.g., oil shale projects) would be a net increase in the amount of energy available to the region and to the nation. The cumulative impacts of energy consumption would potentially require expansion of existing energy production and distribution facilities. The net impact would be positive since these additional production and distribution capabilities would improve the opportunities for growth within the region.

Transportation

The cumulative effects of assumed projects would add additional pressures to existing transportation systems and potentially result in more traffic congestion, accidents, and road repair costs. Road, railroad, air traffic, and pipeline improvements would be necessary to accommodate increased transport requirements. The cumulative effects of road and rail traffic would increase maintenance time and costs on these systems. However, a beneficial positive effect would occur due to the expansion of the transportation facilities. Once expanded, these facilities would be available for other uses following project closures.

4.18 Mitigation

Mitigation is defined as avoiding, minimizing, compensating, rectifying, reducing, or eliminating an adverse environmental impact (BLM 1981d). The mitigation measures presented in this section are actions that could reduce or eliminate the impacts identified in Sections 4.2 through 4.13.

Two types of mitigation measures are presented: (1) committed — resulting from procedures outlined in the Operator's Proposed Action or the requirements of state, federal, or local laws and regulations regarding project development, and (2) uncommitted — suggested measures to be considered by the applicant, or by regulatory agencies in their permitting processes. The latter measures are proposed in consideration of economic, technical, and political feasibility.

Regarding committed mitigation required by regulatory agencies, the BLM can require and enforce mitigation measures only on BLM-administered land (not on private land), except in cases where a federal law provides specific authority. Measures may also be required and enforced by BLM if the measure is designed to mitigate an impact that could affect BLM-administered land. The Operator has indicated its mitigation commitments will apply wherever necessary, including federal, state, or private lands. Authority for other requirements is controlled by federal and state agencies.

More detailed mitigation measures are presented in Appendix C-1. They pertain to impacts for various environmental disciplines (e.g., ground water, wildlife). Starred (*) activities in Appendix C-1 are those to which the Operator is committed. Mitigation for each of these activity areas is identified according to project phase: construction, operation, or reclamation. Socioeconomic mitigation is presented in Appendix C-2 by subject area (e.g., housing).

4.18.1 Discipline-Specific Mitigation Measures

The following statements summarize recommended mitigation in each discipline as applicable to the CCSOP alternatives.

Air Quality and Meteorology

At all times during construction and operation of the CCSOP Operator is required to conduct its activities in accordance with all applicable air quality laws and regulations and all required permit conditions. The Operator will apply best available control technology to all facilities and activities included in PSD permits. In addition, the Operator will, within the context of its PSD and state air quality emissions permits, observe required emission limits (see Section 1.3 — Other Required Authorizations, in the DEIS).

Noise

Mitigation for primary and secondary noise impacts is generally included with the Proposed Action.

Water Resources

The primary overall impact to ground and surface waters would be contamination in the form of TDS, TSS, and nonhazardous wastes by surface runoff or ground water flowing through disturbed areas, or by pipeline or other toxic spill material entering stream courses. The mitigation of such impacts would include: (1) proper routing of all surface flows around disturbed areas, (2) sedimentation ponds at points downstream of all disturbance areas to reduce TDS and TSS, (3) contingency plans for handling all accidental spills, (4) use of sediment control measures where appropriate, and (5) prevention of spent shale leachate from entering surface and ground water systems. With respect to other mitigation, see Section 1.2, EIS Regulatory Actions, and Section 1.3, Other Required Authorization, in the DEIS concerning federal and state regulatory authorities pertaining to water resources.

Topography

Most topographic impacts would be associated with changes at the mine site, facilities sites, reservoir sites, and project corridors from construction through reclamation of the project. In general, measures to reduce these impacts would include (1) avoidance; (2) proper engineering design of open pit slopes, spent shale piles, reservoir embankments, cut and fill slopes, landfills and other features; and (3) adherence to a reclamation plan that requires proper contouring.

Geology

Geologic impacts would result from disruption of site stratigraphy and extraction of the shale oil resource. Landslides, slumping, and/or other mass-wasting processes could occur from cut/fill activities at the mine site, facilities sites, reservoirs, spent shale disposal areas, and transport corridors. Mitigation measures to reduce these impacts would include: (1) avoidance of areas on stratigraphic units exhibiting instability; (2) proper engineering evaluation including geotechnical assessments of the geologic setting prior to construction; (3) design of proper drainage systems to minimize slope surcharging (overloading) by ponds or undercutting by running water; and (4) reclamation of temporary and (where appropriate) permanent features to minimize potential for man-induced instability.

Paleontology

Impacts to paleontological resources would result from disruption of fossil-bearing strata during construction of project facilities, reservoirs, disposal areas and transportation networks, and from the actual mining of the oil shale. Surface mining of oil shale would create the highest potential for impact. Additional impacts may be experienced locally during associated infrastructure development.

In general, measures to reduce these impacts would include (1) avoidance of known fossil collection sites and (2) survey of suspected fossil-bearing strata during construction, operation, and reclamation of the project. Fossil finds encountered during the course of the project would be brought to the attention of the proper federal and state agencies.

Soils

Impacts to soils would occur as erosion losses, losses of prime farmland, changes in soil profile characteristics, and losses of soil cover and productivity. Mitigation of incremental erosion losses would largely be accomplished through the reclamation described in Section 2.3. Erosional impacts not specifically mitigated in this plan would include: (1) erosion of the reclaimed spent shale pile interbench slopes, and (2) streambank or hillside erosion by pipelines, roads, or other types of disturbance.

Mitigation measures applicable to these impacts would include retention of an on-site reclamation specialist who could monitor development activities and suggest mitigation such as (1) reducing slope of reclaimed interbench sideslopes, (2) revegetation, and (3) application of wind and water erosion control measures (asphalt emulsifiers, netting, contour furrows, and pitting). Compensation would probably be the least costly method of mitigating prime farmland losses. Stockpiling and replacement of available cover soil would reduce changes to soil profile characteristics; however, duration of burial should be minimized during operational phases.

Aquatic Ecology

Construction practices which would minimize sedimentation and disturbance of riparian vegetation were assumed during impact assessment. However, construction impacts could be further mitigated if stream crossings and other activities potentially impacting surface waters were conducted at times of the year least critical to biological activity. Avoidance of fish spawning periods would be especially desirable.

Impacts associated with the loss of cold water fish habitat in the upper Clear Creek system could be partially mitigated by providing cold water release from Roan Creek reservoir. Five to fifteen or more miles of trout stream may be lost in upper Clear Creek, depending on the alternative, and only 4-6 miles of stream channel is available below the reservoir. Managing Roan Creek Reservoir as a cold water fishery would help offset the loss of the remaining stream habitat. The reservoir should have good water quality and other parameters needed for a good trout fishery, although natural reproduction would probably not occur. Replacing lost stream habitat with reservoir habitat cannot be considered total mitigation, since cold water stream habitat is becoming scarce in the western United States. Any mitigation utilizing Roan Creek Reservoir should be coordinated with CDOW.

Entrainment impacts of young fish at the De Beque intake structure could be mitigated by adoption of a passive design such as planned for the Loma site. A number of such passive designs have been used in various areas to alleviate similar problems (Richards 1980; Zeitoun et al. 1980; Schrader and Ketschke 1978; Smith and Ferguson 1979), and probably would work in this situation.

Planning for improbable yet serious impacts, such as spills associated with vehicle accidents and pipeline breaks, would likely reduce the magnitude of the impacts. Specific spill cleanup plans, storage of cleanup equipment and supplies on site, personnel training programs, and pipeline construction with check valves on either side of stream crossings to limit the size of a spill; all should be required for any areas that would affect cold water habitat, the Colorado River, or the White River. Plans for such mitigation should be required as part of the permitting process.

The alteration of humpback chub habitat at Black Rocks and Westwater Canyon due to flow depletion could be mitigated by restructuring of the total river flow. It is possible that a restructuring of present flows to resemble a more natural pattern may keep roundtail chubs from hybridizing with humpbacks, but it is doubtful since the result would still be a smaller river.

River flows have been decreased during spring runoff and increased during late summer, fall, and winter due to existing impoundments and other water depletions. A return to a more natural pattern — higher spring flows and lower fall and winter flows — may help alleviate this problem. Additional analysis is needed to determine the feasibility of such an alteration since a number of water rights and existing reservoir operation plans would be involved.

The adoption of a passive intake design at De Beque would eliminate potential entrainment of razorback suckers (a Colorado-listed species). The alteration of the operation plans to not withdraw water during December, May 1-15, June, and July would alleviate impacts regarding FWS recommended levels. (It should be recalled that these numbers have not received scientific peer review or undergone public rulemaking procedures.) Loss of habitat of Colorado squawfish and razorback suckers due to flow depletion may be difficult to mitigate. It could be mitigated by obtaining existing senior rights that are being used. This would eliminate the additional depletion caused by the use of CCSOP or GCC water rights.

The BLM may require changing the route of the Rangely A pipeline in order to protect populations of Colorado River cutthroat trout (a Colorado-listed species) in Soldier and Lake Creeks.

Mitigation for potential losses in Willow Creek due to pipeline failure would be the same as described above. Pipeline failures that could affect threatened and endangered fishes in the Colorado or White rivers should be mitigated as suggested above.

Impacts would be minimized under all CCSOP 50,000-bpd alternatives.

Terrestrial Ecology

Vegetation. Impacts to vegetation from construction and operation activities would include permanent loss of threatened and endangered plant species populations and habitat, loss of riparian habitats and wetland, and loss of rangeland and cropland productivity. Impacts to candidate or listed threatened or endangered plant populations and their habitats could be partially avoided by routing project facilities around them. Since the primary cumulative impact to rare cacti would be the collection of specimens for commercial horticultural purposes, direct impacts to these plants could be compensated for by the restriction of access to undisturbed populations on CCSOP controlled land. Transplanting, artificial propagation, and re-establishment of habitat for threatened and endangered plants would be relatively costly mitigation measures which are uncertain of success. Direct impacts to wetlands could be effectively mitigated by avoidance of disturbances in riparian areas. Since irrigated croplands are much more productive of forage than surrounding areas, avoidance of these areas would significantly reduce impacts on productivity. Revegetation employing native plant species would mitigate the loss of stable and productive plant communities.

Wildlife. The quality of wildlife habitats in affected areas would be reduced as a result of surface disturbance and vegetation removal. The Operator has committed that siting options for major facilities and within corridors would be exercised to the fullest extent feasible to maintain sensitive wildlife habitats and other important areas of wildlife use, including movement corridors. All Category 1 habitats would be avoided, where possible, through construction siting. Loss of Category 2 and 3 habitats and ranges may be mitigated through acquisition and enhancement of properties or acquisition of enhanced properties to offset the project impacts. Riparian, wetland, and aquatic habitats could be maintained or enhanced through use of siting options. Activity buffer zones could be established for bald eagle roost sites, sage grouse leks, and raptor nest sites to minimize disturbance during critical periods. Initial construction could also be timed to avoid critical nesting (raptors and sage grouse) and concentration (bald eagle and big game) periods. Construction on big game winter range could be avoided during December-April, and during May-July on spring ranges.

Public access to critical wildlife habitats under CCSOP control would not be permitted without prior consultation with CDOW and USFWS. In consultation with CDOW and USFWS, an in-house wildlife monitoring program would be developed including such studies as habitat condition and trend, big game population distribution and status (where needed and appropriate, recognizing funding limitations). In addition, appropriate baseline inventories would be conducted over two field seasons to update nesting locations and relative abundance of raptors in vicinity of the Fruita-Clear Creek Mesa corridors prior to any construction. Survey procedures would be developed in consultation with CDOW and USFWS.

Effective wildlife mitigation features would be incorporated into the project design including electrocution-proof transmission lines, fencing of highways, and use of underpasses and one-way deer gates where existing deer movement corridors transect proposed roads. Fencing would be minimized and would not exclude wildlife except from hazardous areas, including considerations for grazing and personnel safety. Fences would be designed in consultation with CDOW and USFWS. Road kill losses would also be minimized through use of mass transportation of workers and strict control of vehicle speeds. Roadway shoulders and narrow ditches would be reseeded with unpalatable vegetation. A company firearm policy would be implemented to curb employee possession of weapons while at work and while commuting to and from the project site. A wildlife protection education program would also be promoted as part of employee orientation. The removal or transplant of protected raptor nests would occur only according to specifically permitted actions by the USFWS and CDOW.

During the construction and operational phases of the project, off-site habitat enhancement measures including chaining, brush beating, clear cutting and selective thinning of forest stands, nitrogen fertilization, and adjustment of grazing pressures could be undertaken to mitigate lost big game carrying capacity. The value of affected areas following project closure and subsequent reclamation would depend on restoration of existing patterns of topographic and vegetational diversity, habitat interspersions, and sources of free water. All disturbed lands would be revegetated, where possible, with vegetation mixtures favorable to wildlife, except in those areas adjacent to roadways. Reclamation for wildlife would be a priority in the final decommissioning of the CCSOP. In addition, the Operator would contribute to consultation, organization, and development of a regional wildlife management plan as appropriate in a cooperatively funded venture with USFWS and CDOW.

Although extensive and costly, the Operator is committed to implementation of most of the above suggested mitigation measures for wildlife impacts (see Appendix C-1). The mitigation specifications are based in part on recent meetings concerning the USFWS Technical Assistance Report and BLM Biological Assessment, and recommendations from the USFWS, CDOW, and BLM.

Visual Resources

Facilities and corridors would alter the character of the local landscape by introducing changes in the natural form, line, color, and texture. Form impacts can be reduced in some areas through design and siting, but for the most part cannot be mitigated. Reclamation of disturbed areas would reduce and, in some cases, eliminate color impacts. Line impacts within corridors could be reduced by constructing corridors to complement existing landscape line; if reclamation is successful, little or no line impact would remain. Mitigation of texture impacts would depend on the success of reclamation efforts.

Cultural Resources

Cultural resource mitigation would involve implementation of cultural resources surveys, as necessary, in advance of construction activities. The BLM will consult with the Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation concerning possible mitigation measures for sites eligible for the National Register of Historic Places. Types of mitigation would include excavation and analysis, avoidance of disturbance, and recording through photographs, drawings, or collection prior to disturbance.

Socioeconomics

Several mitigation measures have been assumed as part of the social and economic analysis, including the 1,500 person single-status camp and the Operator's plan to encourage employee location in areas that can best accommodate growth. These measures could substantially reduce the problem of temporary housing for construction personnel. Other impacts that could be reduced or ameliorated by mitigation are fiscal shortfalls prior to the onset of project-related revenues, and potential increases in demand for human and social services.

The Operator's general approach to mitigation of social and economic impacts of the CCSOP is described below. More specific cooperative actions which the Operator would take in mitigating social and economic impacts in the Garfield and Mesa Counties area are described in Appendix C-2. The actual selection and implementation of specific mitigation programs would be based upon negotiations with local officials at the time of project development.

- The Operator believes that government has the responsibility to provide public services and facilities to both new and existing residents. The Operator recognizes that its project-related growth could aggravate the problems of providing these services and facilities in a timely fashion. The Operator proposes to work cooperatively with government officials to help ensure that financing would be available to meet these needs.
- The Operator believes that growth resulting from the CCSOP would generate adequate revenues to pay its own way; the Operator proposes to work with affected local governments to identify policies which would enable this to happen.
- The Operator proposes to encourage employees to locate in communities with current or planned infrastructure capacity to absorb new growth. This could require various types of incentive programs to ensure the timely availability of housing in certain communities. This would allow growth to occur in the areas with the best capacity to absorb growth without exceeding the capacity threshold of their public facilities.
- Emphasis would be placed on balancing population growth with the tax base. Those areas with a substantial sales or property tax base would be best equipped to respond to growth. As appropriate, the Operator proposes to work cooperatively with government officials to ensure that adequate financing would be available at the front end to provide necessary services and facilities.
- A key factor considered in determining the spatial allocation has been the desire by the Operator to minimize the number of affected communities. The Operator can thereby target its mitigation efforts and develop more comprehensive effective strategies rather than diluting its efforts over numerous communities. The Grand Valley area and Battlement Mesa Planned Unit Development have been identified as areas where the Operator's growth and mitigation efforts would be concentrated.
- The Operator is aware that some infusion of capital into local financial institutions could be needed so that private capital construction such as housing and commercial development could occur. Similarly, in order to achieve its spatial allocation goals, the Operator would use incentives both for the housing industry and for employees.

- The Operator proposes to emphasize quality in all aspects of its mitigation efforts. In particular, through incentives offered to private developers, quality in design of housing and residential development would be stressed, so that desirable and enjoyable living environments are created for new and established residents alike.
- Another characteristic of the Operator's mitigation efforts would be to place emphasis on providing technical assistance to local governments to increase their capability to manage growth. The Operator proposes to work with local governments and entities to identify impacts attributable to the CCSOP and possible solutions.
- The analysis of the socioeconomic study resulted in estimates of potential impacts. However, in order to ensure that the impacts reflect actual conditions, the Operator proposes to develop a monitoring program in conjunction with local governments and agencies.
- The Operator proposes to provide regular employment estimates and updated scheduling information. The Operator would also provide information to new employees concerning the availability of housing and public services.
- The Operator recognizes that the delays and uncertainties associated with the shale industry could make it more difficult to use traditional financing mechanisms, such as bonding, for public facilities. These could also inhibit the private sector from building housing on a speculative basis. The Operator recognizes this problem, and would make the necessary commitments or guarantees to ensure that adequate facilities and services would be in place in time to serve the new population.
- The Operator proposes to continue its cooperation with the Cumulative Impacts Task Force (CITF), the Colorado Joint Review Process (CJRP), and local government agencies.

Land Use, Recreation, and Wilderness

These impacts would result primarily from increased population in the project and vicinity. Proper planning, use of regulatory controls such as zoning, and restriction of access to recreation and wilderness areas may be required to minimize degradation from overuse. The BLM may require the Rangely A pipeline route to be changed to protect a population of Colorado River cutthroat trout. The BLM is currently enforcing a "no-surface occupancy" stipulation on a portion of the proposed pipeline route.

Energy

Mitigation for energy impacts differs somewhat from the mitigation for other strictly environmental discipline sources. Power requirements of the project must be met to allow for project development. Mitigation of any impacts to the present energy network may be accomplished by cogeneration, construction of additional power generating sources (e.g., Colorado-Ute Southwest Plant), or expansion of existing services utilizing power from other areas. Any of these options must meet both engineering and regulatory criteria for construction.

Transportation

Mitigation measures to reduce impacts to the transportation network would include road construction and improvements, land use planning, implementation of a mass transit system, and shift scheduling. Road improvements would include work on the Roan Creek Road and other roads as necessary. Road improvement plans could be developed in cooperation with government entities. Planning efforts could be implemented (with local government) to accommodate necessary railroad facilities and transshipment activities on land owned by the Operator. Additionally, if a bypass around De Beque to connect to I-70 becomes necessary, planning efforts could be undertaken in conjunction with De Beque authorities. A bus system or alternative mass transportation system could reduce the effects of the workforce on roadways. The system could have pickup points in both counties. Varying shift schedules could also minimize conflicts with other traffic using the regional transportation system.

4.18.2 Reclamation Potential

One of the most significant impacts of the CCSOP would be surface disturbance due to mining and associated facilities; therefore, reclamation would be an extremely important mitigation measure.

A relative assessment of the reclamation potential was performed on the siting alternatives and major project configurations. This assessment also facilitates comparison of reclamation potential among various components of the alternative packages (e.g., the La Sal pipeline route compared to other applicable pipeline routes). Factors assessed were available topsoil, slope, plant community response to disturbance, and precipitation. Qualitative estimates of reclamation potential were made and are summarized in Table 4.18-1. The type and duration of disturbances associated with each alternative and major project configuration are also identified.

Despite a shorter growing season, the areas at higher elevations in the project vicinity have greater potential for reclamation than those at lower elevations, primarily because of greater amounts of precipitation, lower potential evapotranspiration, and generally greater volumes of topsoiling material. Average topsoil replacement

Table 4.18-1 SUMMARY OF RECLAMATION POTENTIAL

Siting Alternative	Disturbance Types ^a	Duration (S,L,R) ^b	Reclamation Potential (-3 to +3) ^c	Reclamation Proposed Yes or No
Open Pit Mine	1	L	0.9	Yes
Mesa Valley Fill Spent Shale Disposal	1	L	1.1	Yes
Clear Creek Plant Site	1	L	0.9	Yes
Grand Valley Plant Site	1	L	-0.8	Yes
Upper Dry Fork Reservoir	3	R	0.2	No ^d
Lower Dry Fork Reservoir	3	R	0.0	No ^d
Lower Conn Creek Reservoir	3	R	0.4	No ^d
Upper Conn Creek Reservoir	3	R	0.5	No ^d
Parachute Creek Reservoir	3	R	0.4	No ^d
Big Salt Wash Reservoir	3	R	-0.3	No ^d
Roan Creek Corridor	1,2	S,L,R	-0.2	Yes
Big Salt Wash Corridor	1,2	S,L,R	-0.2	Yes
Douglas Pass Road Corridor	1,2	S,L,R	-0.4	Yes
Dorchester Coal Railroad Route	1	R	-0.4	No
Straight Line Tunnel Route	1,2	R	0.0	No ^d
Roan Creek Tunnel Route	1,2	R	-0.2	No ^d
Rangely Corridor A	2	S	0.6	Yes
Rangely Corridor B	2	S	0.6	Yes
La Sal Corridor	2	S	0.6	Yes
Grand Valley SOPS Corridor	2	S	UA	Yes
Clear Creek Mesa SOPS Corridor	1	S	0.8	Yes
Buck Gulch Corridor	2	S	0.2	Yes
Parachute Creek Pipeline	2	S	-0.1	Yes
Rail Road Spur at De Beque	1,3	R	-0.2	No ^d
Spent Shale Disposal Areas				
Stove/Buniger Canyon	1,3	R	-0.6	Yes
Garvey Canyon	1,3	R	-0.6	Yes
Dry Gulch	1,3	R	-0.8	Yes
Munger Creek	1,3	R	-0.6	Yes

^a Soil Removal = Type 1

Soil Disturbance = Type 2

Inundation = Type 3

^b S = short term; L = long term; R = Residual

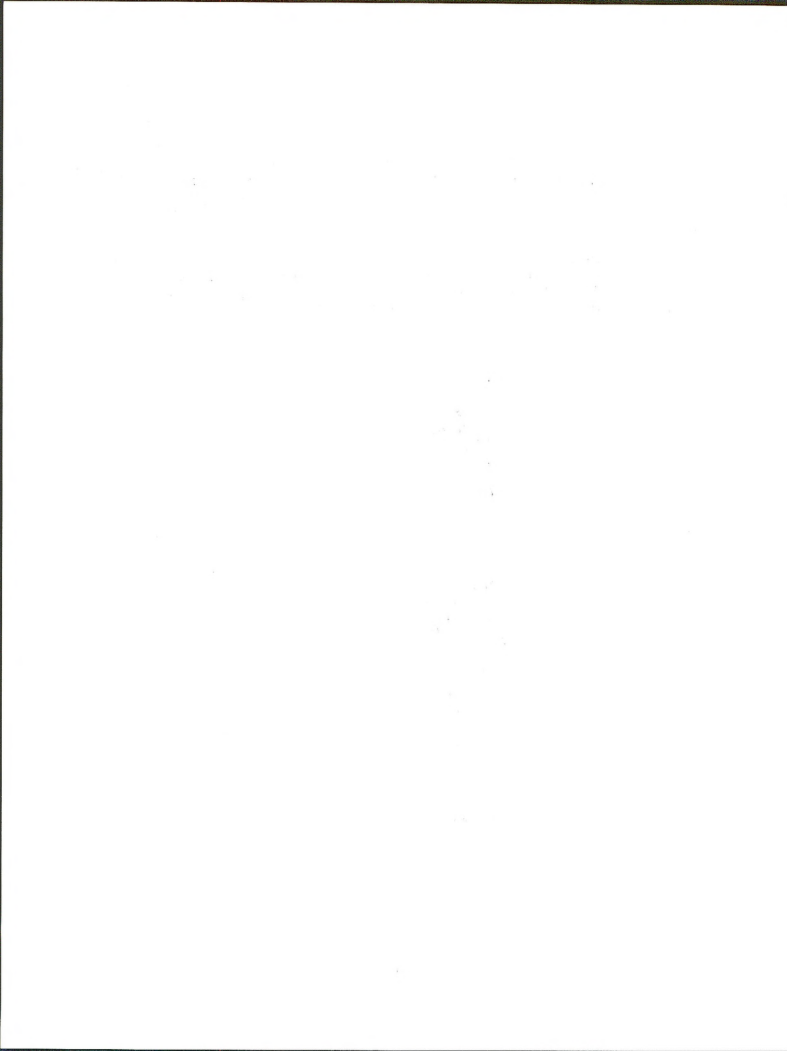
^c Relative estimates; although numerical ratings coincide with impact analysis matrices, evaluation procedures are not the same. Sum and mean of values presented in "Reclamation Potential (-3 to +3)" column for each configuration.

^d Only revegetation of cut and/or fill slopes.

depths (available topsoil volumes respread over disturbed areas) at these higher elevations are of adequate thickness (15-25 inches). Plant communities at these elevations having the highest revegetation potential include grasslands and plateau shrublands (Terwilliger et al. 1974).

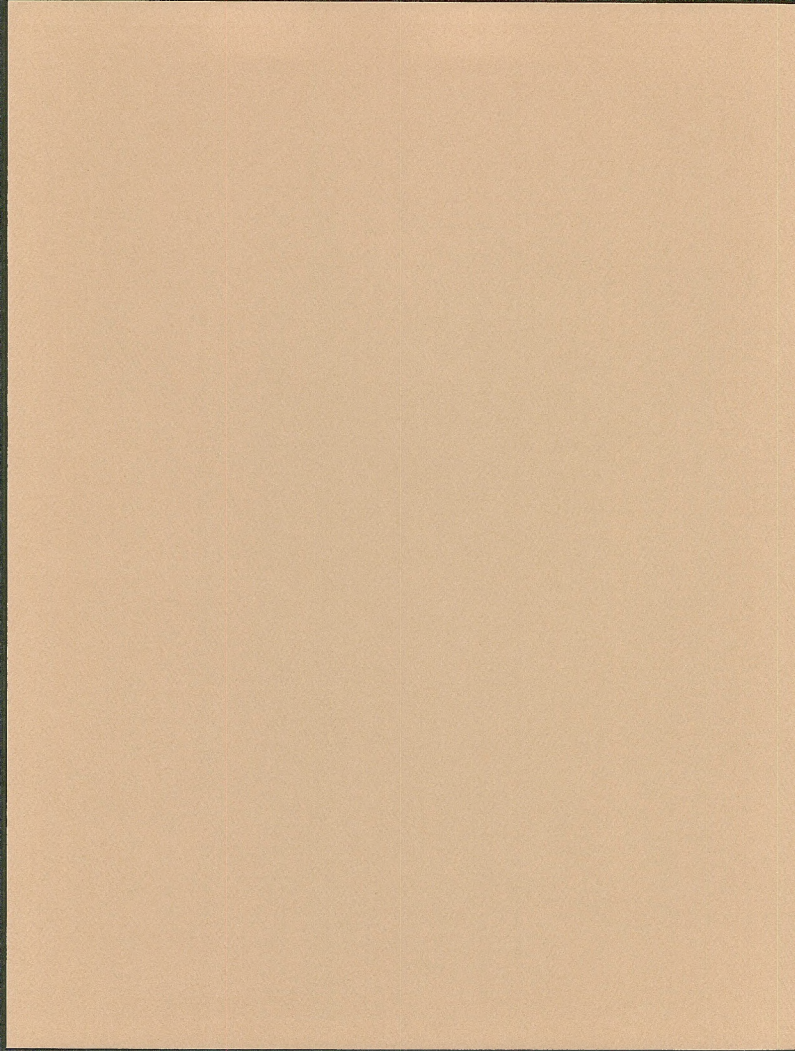
Based on considerations of available topsoil, slope, plant community response to disturbance, and annual precipitation, the CC-50 and CC-100 alternative configurations would have the greatest reclamation potential. This is due to the fact that the majority of project features under these configurations occur in higher precipitation zones and areas with greater volumes of available topsoil, thus contributing to higher reclaimability. Likewise, the PA-50 and PA-100 project configurations would have good potential reclaimability.

Many of the project components of FI-50, FI-100, and FII-50 would be located in lower precipitation zones and have relatively less available topsoil for use during reclamation. Therefore, reclamation potential of these configurations would be fair to poor. The FII-50 alternative configuration would have the lowest reclamation potential of all configurations. FI-50 and FI-100 would have fair reclamation potential.



Consultation and Coordination

[illegible]



5.0 CONSULTATION AND COORDINATION

5.1 Introduction

The CCSOP has undergone regulatory coordination and public review through the Colorado Joint Review Process (CJRP). The Bureau of Land Management, Colorado Department of Natural Resources, and Mesa and Garfield counties served as members on the CJRP Coordination Team. Other local, state, and federal agencies with regulatory and review authority over project activities participated to ensure coordination of their respective responsibilities. The CJRP served as a forum for exchange, discussion, and dissemination of information. CJRP participants have been actively involved in project scoping and have been continuously appraised of project developments.

Government agencies or entities involved in the review of the CCSOP and production of this EIS are listed below by jurisdiction.

Federal Agencies

- Bureau of Land Management
 - Colorado State Office
 - Meeker Office (incorporating Craig Office comments)
 - Moab (Utah) Office

- National Park Service
 - Denver
 - Fruita

- Environmental Protection Agency
 - Denver

- Fish and Wildlife Service
 - Denver
 - Grand Junction
 - Salt Lake City

- Army Corps of Engineers
 - Sacramento (California) Office

State Agencies

- State of Utah

- State of Colorado
 - Department of Natural Resources
 - Mined Land Reclamation Board
 - Division of Wildlife
 - Geological Survey
 - Division of Water Resources
 - Water Conservation Board
 - Soil Conservation Board
 - Department of Health
 - Department of Highways
 - Department of Agriculture
 - Department of Regulatory Agencies
 - State Historic Preservation Office
 - Governor's Office

County Agencies

Garfield County
Impact Coordinator
Planning Director

Rio Blanco County
Impact Coordinator

Delta County
Impact Office

Mesa County
County Planner
County Administrator

Towns and Communities

Grand Junction
City Manager

Rifle
Mayor's Office

Fruita
City Manager

New Castle
Planning Department

Glenwood Springs
City Planner

Parachute
Town Manager

Palisade
Mayor's Office

Silt
Town Planner

De Beque
Mayor's Office

Other Agencies

Associated Governments of Northwest Colorado

In addition, copies of various EIS-related documents were sent to numerous individuals.

5.2 Review of the Draft EIS

The Draft EIS was filed with the Environmental Protection Agency on 25 February 1983. The notice of availability was published in the 4 March 1983 issue of the Federal Register. The notice was made available to the

news media in the State of Colorado. Copies of the DEIS were mailed to federal, state, and local government agencies and to interested organizations and individuals. Copies of the DEIS were available upon request and public review copies were available throughout Colorado, Utah, and Washington, D.C. The public comment period of 60 days ended on 3 May 1983.

Formal public hearings were held at 7:00 p.m. in Grand Junction, De Beque, Rifle, and Denver on April 4, 5, 6, and 7, 1983, respectively. Copies of the transcripts are available for public review at the Grand Junction BLM office.

5.3 Response to Comments

All letters and testimony were reviewed and considered in preparation of the FEIS. Comments which addressed the adequacy of the DEIS received separate response. Each commentator was assigned an index number. Commentors are listed on Table 5-1. Commentors 1 through 44 submitted comments in writing; Commentors 45 through 53 testified at the hearings.

Lengthy comments were paraphrased, and the commentator number (or numbers) are shown following the original or paraphrased comments. Where appropriate, comments of a similar or identical nature were combined into one generalized, paraphrased statement. Thus, the comments which follow are presented as in the following sample format:

3. Comment: The original or paraphrased comment is given. (6, 24).

Response: The response is given.

The response for each comment either identifies that the text of the EIS was changed or provides the rationale for why the comment did not require a text change. Minor text changes are not reprinted in the FEIS, but are recorded in BLM files. Comments are provided by environmental components (e.g., vegetation, wildlife) in the same order they appear in Chapters 3 and 4 of the DEIS.

Comment letters and pertinent abstracts of the hearing transcripts are reproduced in Section 5.4 of this chapter. Several letters had attachments to support or clarify their concerns. These attachments are not reproduced to save space and costs. Copies of the attachments are available for public review at the Grand Junction BLM office.

5.3.1 EIS Summary/Abstract

1. Comment: Minor changes should be made to the EIS summary and Section 1.0 of the DEIS to reflect GCC water development plans. (15).

Response: Concur.

2. Comment: The EIS Abstract and EIS Summary should be revised and clarified and maps provided. (14, 15, 16).

Response: Concur. See revised Abstract and Summary.

3. Comment: A resource data summary should be presented in one location in the FEIS. (35).

Response: Resource data is scattered throughout the EIS because of its interdisciplinary nature. The reader is referred to the EIS Summary and the Comparison of Alternatives (DEIS) sections for a summary of resource impacts. BLM does not believe a resource summary is necessary for purposes of the EIS.

Table 5-1 LIST OF COMMENTORS ON CLEAR CREEK SHALE OIL PROJECT DRAFT EIS

1. Grand River Hospital District	28. Colorado Department of Health
2. Office of Surface Mining	29. Colorado Department of Highways
3. City-County Planning	30. Colorado Department of Agriculture
4. Lynn S. Cudlip	31. Colorado Historical Society
5. American Lung Association	32. U.S. National Park Service
6. Dale B. Albertson	33. Colorado Natural Areas Program
7. Garfield County Commissioners	34. City of Fruita
8. Mesa County Commissioners	35. Mobil Oil Company
9. Mesa County Planning Commission	36. Friends of the Earth
10. Bureau of Reclamation	37. University of Colorado
11. Michael Duncan	38. National Wildlife Federation
12. Freddie Franks	39. Environmental Defense Fund
13. Getty Oil Company	40. Dorchester Coal Company
14. Cities Service Company	41. U.S. Army Corps of Engineers
15. GCC Joint Venture	42. Garfield County Citizens Association
16. Chevron Shale Oil Company	43. Colorado Division of Commerce and Development
17. Sohio Shale Oil Company	44. U.S. Environmental Protection Agency
18. U.S. Fish and Wildlife Service	45. Jean Martinez
19. Colorado Division of Wildlife Resources	46. George Fosdick
20. Colorado Water Conservation Board	47. Sandi Knudson
21. Colorado State Soil Conservation Board	48. Ruth Hutchins
22. Colorado Division of Wildlife	49. Connie Albrecht
23. Colorado Geological Survey	50. Dale Albertson
24. Colorado Mined Land Reclamation Division	51. Bill Prather
25. Colorado Executive Director's Office	52. Rocky Smith
26. Colorado Air Pollution Control Division	53. Robert Yuhnke
27. Colorado Waste Management Division	

5.3.2 Purpose and Need

1. **Comment:** Minor revisions are required to the text of Section 1.0 for purposes of clarification. (15, 16, 19, 25).

Response: We generally concur.

2. **Comment:** Additional clarification should be provided in Section 1.0 regarding issues identified during the scoping process. (16).

Response: Concur.

5.3.3 Proposed Action and Alternatives

5.3.3.1 Description of Proposed Action and Alternatives

Project Description

1. **Comment:** Estimated water needs for all of the GCC joint venturers should be clarified. Amounts and locations of the various water sources should also be clarified by additional information or editorial changes. (14, 15, 16, 18, 50).

Response: The estimated annual withdrawal of the GCC has been amended in Table 2.3-9(A) below.

Table 2.3-9(A) ESTIMATED WATER REQUIREMENTS FOR 100,000-BPD PRODUCTION FACILITIES FOR GCC PARTICIPANTS INCLUDING CHEVRON, GETTY^a, AND CITIES SERVICE^a

Project Component	Estimated Water Requirements (Acre-ft/day)	
	CCSOP	Total GCC
Mining	8	23
Retorting	26	100
Upgrading	9	28
Domestic	23	68
Total	66	219

^a The impacts associated with the Getty Oil and Cities Service proposed oil shale projects are being studied in a separate on-going EIS under the direction of the U.S. Army Corps of Engineers.

The total water requirement for the 100,000-bpd CCSOP is 24,000 acre-feet per year. The estimated resulting average annual depletion is approximately 20,000 acre-feet. The amount of water derived from the alluvial wells will vary from year to year. An important consideration in the operation of the CCSOP water system will be minimizing pumping costs. Therefore, maximum use of the mesa surface supplies will be made. This source is extremely variable with annual runoff ranging between 500 and 10,000 acre-feet and therefore it can be expected that during dry years the alluvial well system will be used more extensively than during wet years.

During the first phase of commercial operations (10,000-bpd production rate), the mesa, alluvial well, and bedrock well systems will provide all water for mining, retorting, and construction purposes estimated to be about 2,300 acre-feet per year. At the 100,000-bpd production rate, these sources will supplement the Colorado River supplies in amounts that will vary from year to year.

The Operator anticipates that CCSOP demands will be such that up to 12.71 cfs will be diverted by the alluvial wells on an instantaneous or day-to-day basis.

It is estimated that the mesa bedrock wells will produce approximately 200 acre-feet per year with combined diversion rates up to 0.32 cfs. It should be noted that this is non-tributary water and these diversions will not deplete the flow of Clear Creek, Roan Creek, or the Colorado River.

Other potential sources of water in other valleys adjacent to Clear Creek and Roan Creek are speculative at this time.

2. Comment: Ruedi Reservoir should not be eliminated as a water source. The text should have additions and editorial changes to clarify potential use of Ruedi Reservoir. (16, 20).

Response: Concur. The following insert should be added just before the heading "Water Development Plan Phase I" on page 2-30 of the DEIS.

Chevron and Conoco have made a request to the U.S. Bureau of Reclamation to purchase from Ruedi Reservoir, 15,000 acre-feet and 10,000 acre-feet of water, respectively. The Bureau has published an Environmental Assessment as part of its evaluation to select a preferred alternative water sale scenario; it is our understanding that the Bureau intends to prepare a Supplemental EIS addressing that preferred alternative in the future. At this time,

it is not possible to identify water rates and delivery schedules which might be available from this water supply. The supply, if it were to become available, would supplement the yield from junior water rights referenced above when not in priority. Since the water would be withdrawn from the Colorado River, it is expected that the infrastructure for diversion from the river and delivery of such water to the project would be utilized.

3. **Comment:** Editorial changes regarding the description of intake sites and corresponding pipeline routes should be made to clarify the intake/diversion descriptions in Section 2.0. (14, 15, 16).
- Response:** Concur.
4. **Comment:** Table 4.13-1 does not include the 20-MW power requirement for the GCC water project. (14, 15).
- Response:** Concur. Total daily power requirement for 100,000 bpd is 374 MW.
5. **Comment:** Add description for Diversion/Route F. (16).
- Response:** Concur.
6. **Comment:** What requirements would necessitate a Big Salt Wash reservoir? (18).
- Response:** The Big Salt Wash reservoir is required for water use in upgrading for the Fruita alternatives. For the Proposed Action alternative, as well as the Fruita alternatives, the Big Salt Wash reservoir is needed as a contingency against possible interruption of water supply from the Roan Creek reservoir system.
7. **Comment:** Editorial corrections should be made at various points in the Section 2.0 description of proposed water systems to clarify use of these systems. (14, 15, 16).
- Response:** Concur.
8. **Comment:** Editorial corrections need to be made at various places within the text of Sections 2.0 and 4.0 to clarify water storage reservoir system. (14, 15, 16).
- Response:** Concur. See revised text.
9. **Comment:** The estimated water requirements shown in the DEIS are too general; a breakdown of water use for the plant and related facilities should be provided. (10).
- Response:** Concur; see response number 8.
10. **Comment:** Why do the planned water withdrawals exceed 500 cfs and why is the total storage capacity 187,000 acre-feet (Loma and De Beque combined)? (18).
- Response:** The maximum potential yields of 442 cfs (De Beque system) and 125 cfs (Loma system) represent maximum potential yields. The ultimate storage capacity of 187,000 acre-feet (Loma and De Beque combined) is to maintain a sufficient amount of water in storage for operational use during dry and low-flow years. Water withdrawals and storage amount will be governed by Colorado water law.
11. **Comment:** Alternatives to the 16 Road corridor should be considered, if facilities of the CCSOP are located north of Fruita. (3, 4, 48).
- Response:** The preferred access to the Fruita facilities is now SH 139 (Douglas Pass) for the road corridor and the Dorchester Coal route for rail transportation. See revised Section 2.4.11.
12. **Comment:** Uses of the corridors and the feasibility of each for major project configurations needs clarification. (4, 49).

- Response:** The corridors proposed for each project configuration, as well as the alternatives, are presented in revised Figures 2.3-1 through 2.3-4 and are described at various locations throughout Section 2.3 of the DEIS. While there are many alternatives discussed, careful review of the text and above-mentioned Figures will alleviate any confusion. BLM's preferred alternative along with any preferred alternative corridors is detailed in Section 2.4.11, as well as in the Record of Decision.
- All corridors will be used for multiple purposes as indicated on revised Figures 2.3-1 through 2.3-4, as supported by the text of Section 2.0 of the DEIS.
- 13. Comment:** A frontage road is needed for livestock movement (driveways), agricultural equipment, school bus traffic, and local community traffic. The Roan Creek access road should be planned for use by other oil shale operations. Fencing should be considered. (6, 50, 51).
- Response:** The BLM no longer recognizes designated livestock driveways, and from our research, there is no active state statute requiring such livestock driveways. School bus safety will be recognized.
- The Roan Creek access road is adequately described for purposes of the EIS (Figure 2.3-1; Section 2.3.2.4 of the DEIS). Details of road construction will be supplied to the appropriate government authorities before construction commences.
- 14. Comment:** The planned railroad, as shown, is not consistent with the locations of any of the planned reservoir alternatives. (14, 15).
- Response:** Any railroad corridor constructed for any of the major project configurations will be planned and designed so as to allow the development of the required reservoirs. Note that all figures showing the locations of railroad corridors are for general corridor location only.
- 15. Comment:** Increased access due to construction of corridors may have detrimental impacts to wildlife and other environmental resources because of increased human activities. (18, 42).
- Response:** Use of the corridors, including the Big Salt Wash corridor, will be necessary for operation under either the Proposed Action or the Fruita Alternatives (at either 50,000 or 100,000 bpd). Access to the corridors, particularly the Big Salt Wash corridor will be limited by the Operator. Some limited use by humans not associated with CCSOP will occur, but this is not anticipated to be significant.
- 16. Comment:** The "Mesa Valley Fill" surface spent shale disposal site is not specifically identified on Figure 2.3-1. The "Zone I-IV" techniques should be clarified. Appendix A, Section F should be referenced for clarification. (16).
- Response:** Concur. "Mesa Valley Fill" is referred to as "surface spent shale disposal" on Figure 2.3-1. In text, it is referred to as "Mesa Valley Fill". The terms "Zone I-IV" refer to the descriptions of the zone technique described on page 2-26 of the DEIS, as supported by Figure 2.3-11.
- Areas of shale disposal eliminated from detailed study are shown in Appendix A, Section F. See revised text.
- 17. Comment:** Do the amounts of water shown for domestic use on page 2-28 accurately reflect population estimates, and are the per capita water consumption figures accurate? (20).
- Response:** The estimated domestic water use of 23 acre-feet per day is presented to accommodate for at least the amount of increased population due to operation of the CCSOP at 100,000 bpd (see Tables 4.12-15 and 4.12-17 in the DEIS).
- The value of 8,800 reflects the number of taps in Grand Junction, not actual population.

- 18. Comment:** Various editorial changes and more discussion is needed in Section 2.0 to clarify upgrading facilities and wastewater treatment. (16).
- Response:** Concur. Wastewater treatment includes treating sour water, oily water, process area drainage, and sanitary sewage. The sour water treatment includes removal of hydrogen sulfide, carbon dioxide, and ammonia before water reuse. Oily water treatment includes solids settling and oil flotation. Process area drainage includes cooling tower and boiler blowdown, clarifier sludge, demineralizer waste, and filtration backwash. Treatment includes settling, cooling, and possibly oil removal before reuse. Sanitary wastewater treatment includes typical primary and secondary treatment.
- 19. Comment:** Design and operation of the sedimentation pond, downstream storage reservoir, and potential salt loading should be discussed in more detail. (10).
- Response:** Sedimentation ponds are designed to contain water and sediment generated from the project area. As such, they are a self-contained system with no discharge. After the proper retention time, water will be pumped from the sediment ponds to the project area for use in the spent shale disposal process.
- The downstream storage reservoir will not have a direct connection with the project area. Runoff to this reservoir will be from existing drainages, hence having water quality similar to that presently existing in the drainages of the region.
- 20. Comment:** How much limestone will be transported in addition to the 6,500 tpd of coal? (25).
- Response:** The 6,500 tpd of coal is the maximum requirement for retorting and upgrading. The corresponding maximum requirement of limestone is 938 tpd for retorting and upgrading.
- 21. Comment:** References to pipeline sizes in Figure 4.4-2 should be deleted. (14, 15).
- Response:** Disagree. It is helpful to the reviewer if some indication of size is given to allow for better assessment of the proposed project. The revised maps will note, however, that the sizes of the pipelines are only approximate.
- 22. Comment:** The sources of coal, electricity, and aggregate resources for the project need to be discussed in more detail. (36)
- Response:** Information supplied by Colorado-Ute Generating Association indicates that adequate electrical power for the project is available in the existing grid system (Colorado-Ute 1983). The location of other resources (coal, aggregate) have not been identified at this time.
- 23. Comment:** What are the techniques of backfill placement, what will be the resulting permeability, and is there enough material to fill the open pit? (42, 44).
- Response:** Backfill of waste rock will be primarily by conveyor. Resulting permeabilities will be primarily dependent on the nature of the material being backfilled (e.g., sandstone, shale, siltstone). Considering the geology of the area, resulting permeabilities are presumed to be moderate. Details on permeability of backfilled spoils are more applicable to the information to be supplied with mining and reclamation permit for the Colorado Mined Land Reclamation Division. Such details will be supplied, as applicable, at that time.
- Final reclamation contours are indicated in Figure 2.3-12 of the DEIS. Considering that a certain amount of waste rock is coming from the underground mine (the waste rock has a swell factor of 33 percent), and that spent shale will also be placed in the pit, there will be enough material for adequate backfill. Note that the reclamation contour elevations are at or above existing contours (Figure 2.3-12).

- 24. Comment:** Editorial changes are needed to the Proposed Action and Alternatives Section (2.0) for clarification purposes. Subject areas include upgrading and retorting processes and facility locations, fuel preparation, aggregate resource location, and reservoir designation. (16).
- Response:** Concur.
- 25. Comment:** Minor changes are needed to Figures 2.3-1 through 2.3-4 for clarification purposes. (14, 15, 16, 25).
- Response:** Concur. See revised Figures 2.3-1 through 2.3-4, presented in the EIS summary.
- 26. Comment:** Minor corrections are needed to Figures 3.8-1 and 3.8-2 regarding locations of intake structures. (14, 15, 16).
- Response:** Concur.
- 27. Comment:** The Lower Conn Creek dam site is incorrectly sited on Figure 4.4-1. (14, 15).
- Response:** Concur. See revised Figure 4.4-1.
- 28. Comment:** Minor text changes and clarification should be added to Sections 2.1 through 2.4.10 of the DEIS, concerning the Proposed Action, Alternatives, and Impact Comparisons. (14, 15, 16).
- 28. Response:** Concur.

Project Alternatives

- 1. Comment:** Reasons for eliminating alternatives from detailed study are not always clearly stated in Appendix A of the DEIS. Table 2.2-1 should be checked to ensure it is consistent with Appendix A. (16).
- Response:** Concur. Table 2.2-1 has been cross-checked with Appendix A and both have been found to be generally consistent. In some instances, the reasons for elimination of alternatives presented in Appendix A could be expanded. However, for each of those major alternatives eliminated from detailed discussion, the BLM has determined that the reasons given in Appendix A are adequate. Selected examples of such major alternatives are: Parachute Creek property, Skinner Ridge retort, and Ruby Lee Reservoir. Those explanations that could be expanded in Appendix A are for minor alternatives (e.g., Douglas Pass Road Routes A and C) and the BLM has concluded that the presentations of detailed discussion regarding elimination is not necessary for these alternatives.
- 2. Comment:** The Final EIS should take a much closer look at the advantages and disadvantages of the Fruita versus Clear Creek alternatives, especially in terms of the land use patterns and impacts. (42).
- Response:** BLM believes the impacts of the two alternatives are adequately analyzed and compared for the purposes of the EIS. A land use impact analysis is given in Section 4.11.1 of the DEIS, and impacts for the alternatives are compared and discussed in Section 2.4.
- 3. Comment:** The Proposed Action (PA-100) is not the configuration which the Operator has submitted in their applications to EPA for a PSD permit or the Colorado Air Quality Control Division for a State Air Quality permit. The configuration for which they received an application is more like the Fruita 1 (FI-100) alternative. (44).
- Response:** The Proposed Action has remained constant throughout the EIS process. Project planning has changed, however, such that the preferred alternative which the Operator wished to permit for air quality purposes was more like the FI-100 configuration. Both configurations were analyzed in the DEIS.

- 4. Comment:** More explanation and justification should be given as to why BLM chose to assess impacts for the contrasting Clear Creek and Fruita I major alternative project configurations. (50).
- Response:** The BLM developed a full range of alternatives for purposes of impact comparisons. The Clear Creek alternative was, therefore, developed as a logical alternative to the Proposed Action. It places all activities in the Roan Creek drainage. When the social and economic impacts were analyzed, it was obvious that it would be beneficial to spread the workforce out over a larger area. It was also desirable to spread out the air polluting activities over a larger area to reduce the impacts. The Fruita alternatives offered this contrast.
- 5. Comment:** More attention should be given in the EIS to the 50,000-bpd alternative. (49).
- Response:** The 50,000-bpd alternatives were adequately considered for EIS purposes. Review of Section 2.4 and Chapter 4.0 will show that the 50,000-bpd alternatives were analyzed and compared in a similar manner. Each alternative was compared to the Proposed Action, and differences in impacts were identified.
- 6. Comment:** Discuss more fully in the EIS the need to address the range of major project alternative configurations, production rates, relative land disturbance, economics, air quality, and other impacts associated with each. (6).
- Response:** The BLM chose alternatives regarding production rates, land disturbance, and air quality impacts in order to compare and contrast them to the Proposed Action. BLM discussed all such alternatives with the Operator and determined that they were economically and technically viable options at this time. Technical details regarding acreages of land disturbance and exceedence of air quality standards are discussed by discipline in Chapter 4.0 of DEIS.
- 7. Comment:** More discussion should be given to alternative energy sources to the proposed oil shale project. (11).
- Response:** This type of discussion is beyond the scope of this EIS. However, we refer the reader to the Draft EIS on the Federal Oil Shale Management Program (BLM 1982b) and the 1983 Prototype Oil Shale Leasing EIS (BLM 1983d). National policy initiatives, such as funding, provided through the Synthetic Fuels Corporation, support development of synthetic fuels as an alternative energy source.
- 8. Comment:** Why was De Beque not chosen as an alternative residential area for the majority of project workers and support personnel? It would seem to offer several advantages. (50).
- Response:** The socioeconomic impact study did seriously consider De Beque, but later eliminated it as a feasible alternative. In fact, a portion of the expected population is expected to locate in De Beque. However, as a result of input from numerous local officials, it was determined that a majority of the population should be directed to communities with infrastructure capacity to absorb growth without undue financial impact. See also Section 5.3.13 of the FEIS and Section 4.12 of the DEIS.
- 9. Comment:** Based on the potential impacts to tourism and recreation, we request that BLM develop an energy extraction technology alternative that requires the Operator to recycle all polluting emissions and to develop less labor-intensive technology. This is not the same as the no-action alternative, which requires no further research or technology. (52).
- Response:** BLM does not have the expertise or mission to develop such alternative energy extraction technologies. Such a technology is under research and development by various groups funded by the federal government and private corporations.

Spent Shale Disposal

1. **Comment:** Provide more detailed discussions and diagrams in the FEIS of the proposed spent shale disposal techniques and of the potential impacts. Address spent shale disposal volumes at the 50,000-bpd and 100,000-bpd production rates more fully. (10, 11, 16, 18, 27, 36, 42, 44, 49).

Response: Many commentors had questions or concerns about spent shale disposal impacts in general, and CCSOP plans in particular. Therefore, a detailed, illustrated response has been prepared which references other literature and research sources and cross-references other sections of the EIS. The response is structured as follows: first, a discussion is given of CCSOP plans regarding the sequence of spent shale disposal, including disposal volumes and a map. Second, structural design of the disposal pile and potential impacts are addressed, as illustrated by a table and a map. Finally, impacts of the two production rate alternatives are compared.

Sequence of Events — Spent Shale Disposal and Reclamation. The deposition of spent shale at the Clear Creek mesa disposal site would begin in 1988, shortly after the underground mine, retort, and upgrading facilities have commenced operations. The disposal site would be developed in two phases (see Project Description, Section 2.3 of the DEIS). From 1988 to 1995 (Phase I), 94 million cubic yards of spent shale would be deposited in the draws and on the side slopes of Clear Creek. During Phase II (1995-2002), 510 million cubic yards of retorted shale will be placed in the entire mesa valley and south side of Clear Creek for a total of 604 million cubic yards. The volume of spent shale disposed, pile elevation, and sequence of deposition in the Mesa Valley Fill site from the years 1988 to 2002 are shown in Figure 5.3-1.

Revegetation of the disposal pile would begin in Fall 1989 and continue from 1993-1995. Listed below are years in which revegetation would occur, and the acreages to be revegetated each year.

North Side Revegetation (Phase I)

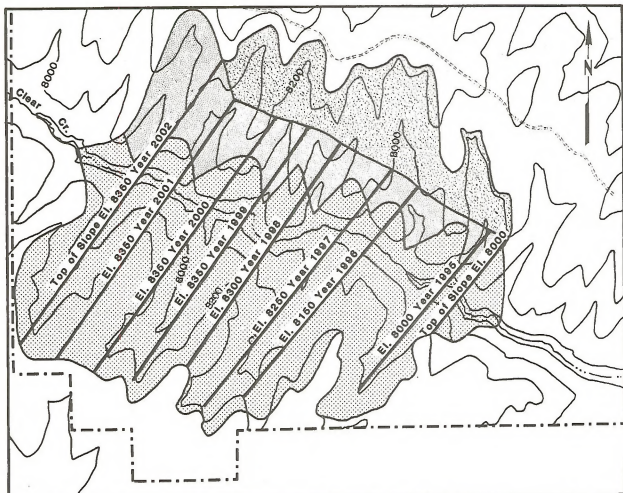
<u>Year</u>	<u>Acres</u>
1989	46
1993	103
1994	99
1995	41
TOTAL	289

For the south side of Clear Creek and the Mesa Valley Fill site, revegetation would begin in 1997 and continue through 2002. Listed below are years in which revegetation would occur, and the acreages involved each year.

South Side and Valley Fill Revegetation (Phase II)

<u>Years</u>	<u>Acres</u>
1997-1998	306
1999-2000	293
2001-2002	282
2003-2004	512
TOTAL	1,393

As portions of the spent shale disposal area reach final configuration for reclamation, placement of revegetation materials would commence (see Figure 2.3-11 of the DEIS).



Cumulative Retorted Shale Volumes (x 10⁶ Cu. Yd.)

Year	Volume
1995	152.762
1996	217.480
1997	282.158
1998	348.859
1999	411.554
2000	476.252
2001	540.850
2002	605.648

LEGEND

- Phase I Disposal 1986-1995 (94 mill yd³)
- Phase I Reclamation 1989-1995
- Phase I Disposal 1988-1995 (94 mill yd³)
- Phase II Reclamation 1997-2004
- Phase II Disposal 1995-2002 (510 mill yd³)
- Phase II Reclamation 1997-2004

Figure 5.3-1 Sequence of Disposal and Reclamation of Spent Shale in the Mesa Valley Fill, 1986-2004.

Within any specified area, a gap of one to several years may exist between the time of spent shale disposal and the commencement of reclamation activities. During this interim period, the spent shale would be watered as needed to control windblown dust.

In the year 2003, sufficient space in the open pit mine would be available to receive spent shale. Deposition of spent shale in the pit would continue until the surface mine and retorts have ceased operations (about 2072). In 2004, revegetation of the compacted retorted shale, which has been backfilled into the open pit, would commence. From 2004 until 2009, revegetation of the pit would proceed at the rate of 113 acres per year. As with the Mesa Valley Fill site, revegetation of spent shale in the open pit would begin within one to a few years after deposition. A conceptual diagram of the pit (cross-section) after reclamation is shown in revised Figure 4.4-4 of the FEIS.

Structural Design and Potential Impacts of Spent Shale Disposal. In response to specific concerns raised by public agencies and interest groups, an expanded discussion of the structural design of the proposed spent shale pile and potential problems associated with it is presented below. A schematic diagram illustrating, in a generic sense, the potential impacts of spent shale disposal is shown in Figure 5.3-2. The reader is cautioned to interpret this diagram as a compilation of singular potential problems which have a remote possibility of occurring during various times over the life of the disposal pile. Discipline-specific impacts of spent shale disposal are listed in Table 5.3-1 and discussed in greater detail in Section 4.0 of the DEIS. Proposed and recommended mitigation is presented in Section 2.0 of the DEIS and revised Appendix C-1 of the FEIS.

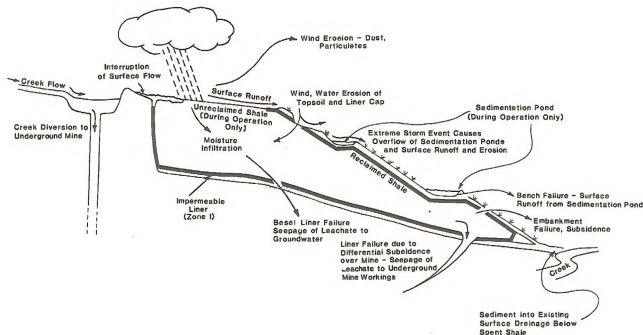


Figure 5.3-2 Potential Impacts of Spent Shale Disposal.

According to the Operator's plans, the disposal and subsequent reclamation of spent shale require that the spent shale be encapsulated by a layer of highly compacted retorted shale (Zone I - see Figure 2.3-11 of the DEIS). The purpose of this liner is to prevent water infiltration to the spent shale pile and subsequent generation of leachate. Studies have shown that retorted shale possesses an inherent cementation characteristic which develops when the shale is moistened, compacted, and cured (Farris 1979). Under proper retorting, compaction, and overburden loading conditions, compacted shale can also be nearly impervious to water (Holtz 1976). Tests performed at the Paraho Oil Shale Project (Holtz 1976) demonstrated that the permeability of retorted and compacted spent shale could be less than 1 foot/year (1×10^{-6} centimeters/second), a value which is indicative of relatively impervious material (Bloomfield and Stewart 1981). The permeability rate of the Zone I layer in the Mesa Valley Fill site and open pit mine is expected to be less than 1 foot/year.

Studies of spent shale piles for the Paraho Project have also shown that spent shale material used for embankment construction, valley lining, or water-retaining structures must have a moisture content of 20 to 22 percent to develop low permeability and provide strength gains from its cementing properties (Holtz 1976). The moisture content of spent shale for the Zone I lining would be about 24 percent, which is an optimal level for cementation. Saturation of the compacted layer is also known to diminish its impermeability and strength (EPA 1977).

Infiltration of ground water into the pile and saturation of the liner is unlikely to occur, since the basal liner and pile will be situated above the water table. Saturation of the basal liner and cap would also be avoided through control of surface runoff and proper reclamation practices as required by law and regulation (see Section 2.0 of the DEIS). Therefore, the likelihood of leachate being generated from the spent shale pile in the Mesa Valley Fill site is low because of the anticipated strength and impermeability of the liner.

Liner failure could occur due to mass movement of material or gully development eroding through the upper cap (Figure 5.3-2). Stability analyses on spent shale slopes and benches by the Operator have shown that the predicted factors of safety (based on spent shale density, cohesion, and angle of internal friction) would fall within levels that are both acceptable and supported by previous engineering studies on spent shale slopes (Holtz 1976; Peterson 1979; Bloomfield and Stewart 1981). Therefore, liner failure as a result of mass movement is an unlikely event as long as proper engineering practices, as proposed by the Operator, are employed.

Factors which may facilitate erosion of the liner cap (and subsequently increase discharge and surface runoff from the spent shale piles) include precipitation, surface infiltration, snowmelt runoff, groundwater infiltration, geochemical characteristics of the spent shale, and integrity of the spent shale disposal system (see Figure 5.3-2). Control of surface runoff and proper reclamation practices should significantly diminish the potential for liner cap erosion.

It is difficult to predict the water quality of leachate and runoff (including salts, toxic elements) from the spent shale piles (particularly the unreclaimed portions) due to the complexity of geochemical processes as discussed in the FEIS (Section 4.4.1.2). Tests on chemical leachate from Paraho retorted oil shale shows concentrations of total dissolved solids (TDS) on the order of 1.4 percent by weight, small amounts of potassium, chloride, sodium, sulfate, carbonates, and 2 percent soluble salts (Holtz 1976; EPA 1979). Leaching tests of uncompacted retorted shale show that potentially high concentrations of sodium, calcium, magnesium, and sulfate may occur in runoff; however, the concentration of these chemicals diminishes significantly when the shale is properly compacted (EPA 1977). The CCSOP would implement surface water management and monitoring systems, as described in Section 4.4.1.2 of the FEIS, to detect any problems with water quality which may originate from the spent shale disposal area. These systems would be subject to the review and approval of the EPA, Colorado Water Quality Control Division, Colorado Mined Land Reclamation Division, and other agencies.

As identified in the DEIS (page 4-56), rock fractures within the shale disposal area may provide a high permeability migration pathway for leachate should the basal liner fail (Figure 5.3-2). Fractures, faults, and lineaments are all the result of earth stresses that cause breakage of the rock that, in the case of faults, also has a component of movement along the breakage zones. Most of the joints and fractures observed on-site are near vertical in orientation with major trend directions generally north-south and east-west. Many of the lineaments mapped on-site are along this trend and are probably associated with fracturing, rather than with faults. A more detailed description of structural geology of the project area is presented in the CCSOP geologic baseline report (Chevron 1982a).

The co-disposal of process or non-process wastes in the retorted shale pile may cause differential settling, shifting, and overall instability of the pile, particularly if a large quantity of waste is dumped into the spent shale area. It is anticipated that, since the landfill sites would be relatively small in size and the spent shale pile would probably undergo a settling period of a year or more before reclamation, the co-disposal of wastes will not pose a serious hazard. Potential co-disposal problems and mitigation would be addressed in the mining and reclamation permit application.

Facility Siting Alternatives — Spent Shale Disposal. The disposal site for the Proposed Action, Clear Creek, and Fruita I Project Configurations at 50,000 would be in the same location as that described in the Proposed Action at 100,000 bpd. With modification of the

disposal design, the Mesa Valley Fill site will be able to accommodate 900 million cubic yards of material on approximately 3,000 acres. More spent shale will be placed in the Mesa Valley Fill site at the 50,000-bpd production level (900 million cubic yards) than at the 100,000-bpd level (605 million cubic yards) because the 100,000-bpd configurations use the open pit for spent shale disposal, thus minimizing the need to dispose of spent shale in the surface disposal area.

Fruita II Project Configuration. Spent shale from the Fruita II alternative would be disposed of in one of four alternative surface disposal sites in the Grand Valley as described in Section 2.3.4.3 of the DEIS. Approximately 62,000 tpd of spent shale would be produced throughout the life of the mine (25 years) for the Fruita II (50,000 bpd only) configuration. During this period of time, a disposal site capable of containing a minimum of 900 million cubic yards of material would be required. A 60-inch overland conveyor would deliver the spent shale from the retorts to one of the four Grand Valley disposal sites. Reclamation techniques utilized for the spent shale sites would be the same as those proposed for the Mesa Valley Fill site.

Table 5.3-1 GENERALIZED POTENTIAL IMPACTS OF SPENT SHALE DISPOSAL

Event	Potential Impacts
Construction and preparation of the disposal area	Loss of wildlife habitat, native vegetative cover
Embankment failure	Contamination of surface water, recharge to shale pile with leachate generation and migration
Bench failure	Increased soil erosion; contamination of surface water, recharge to shale pile
Overflow of sedimentation ponds	Increased soil erosion; contamination of surface water
Portions of disposal pile temporarily unreclaimed	Increased soil and wind erosion; contamination of surface and ground water, recharge to shale pile
Diversion of Clear Creek around disposal pile	Contamination of surface water
Basal liner failure	Contamination of ground water with leachate; leachate migration potentially facilitated by fractures

Hazardous Wastes and Solid Wastes Disposal

1. Comment: Provide further discussion and details on potential hazardous and solid wastes generated by the 100,000-bpd project, potential disposal sites, and potential impacts. (6, 7, 8, 9, 18, 25, 27, 42).

Response: In a project of this size and complexity, detailed information and analysis on the nature and site-specific impacts of every project component is not feasible at early stages of project development. However, the Operator has committed to submit information to BLM and appropriate agencies for approval and adequate environmental analysis before constructing facilities. CCSOP must obtain required permits from federal and/or state agencies for solid and hazardous waste disposal methods and sites.

5.3.3.2 Comparison of Alternatives

Impact Methodology

1. Comment: The numerical impact rating system is inappropriate for all disciplines. Relationships between the numerical ratings and terms such as "significant" and "insignificant" are not clear to the reader. The reader and the decision maker must understand the rationale behind the impact comparisons. (13, 18, 26, 42).

Response: BLM considered various alternate approaches to impact assessments and comparison, and used the -3 to +3 scale where detailed comparisons were necessary between many alternatives (see Section 2.4 of the DEIS). These assessments and comparisons were then used for selecting the agency preferred alternative (Section 2.4.11). The above terms were used to indicate to the lay reader a relative degree of impact. All impacts above +2.0 and below -2.0 were essentially considered "significant", either in a beneficial or adverse sense (respectively). Appendix B-1 of the DEIS more fully discusses the numerical impact rating system and its application.

Specific criteria, such as air quality standards violations, were considered where applicable as a measure of significance for assessing impacts. Such significant criteria are discussed, where applicable, in Section 4.14 (Cumulative Impacts). However, accepted measures across all disciplines are unavailable and often based on value judgements (e.g., wildlife, transportation). Such interdisciplinary impact analysis and comparison is one of the most difficult aspects of EIS preparation.

It should also be noted that the impact analysis methodology was presented in the Impact Analysis Guide (BLM 1982a), a document reviewed by various agencies. It is on file in the BLM Grand Junction office.

Impact Comparison

1. Comment: A section presenting a summary of the environmental consequences is needed in the EIS. (20, 42, 49).

Response: Section 2.4 of the DEIS, Comparison of Alternatives, present summaries of environmental impacts for the major project configurations (Section 2.4.3) and all alternative siting activities (e.g., reservoirs, corridors, etc.) that make up the project configurations (Sections 2.4.4 through 2.4.10).

5.3.3.3 Agency Preferred Alternative

1. Comment: We (Chevron) affirm that the agency's preferred alternative (FI-100) identified in this section (2.4.11) is strongly supported by analyses performed in Chapter 4 and Section 2.4 of the document. However, we believe that this section should be expanded with the inclusion of the following modifications and additional supporting documentation derived from analyses performed in Chapter 4 and comparisons provided in Section 2.4. (16).

1. The agency's preferred alternative should be described and justified in two parts. First, the agency should identify the preferred project configuration and production rate of Fruita I-100 and provide detailed reasons and justifications for supporting that conclusion. Second, BLM should identify the preferred project components associated with Fruita I-100 and likewise identify supporting justifications for each component.
2. Additional support for 100,000-bpd production rate
3. Additional Support for the FI-100 preferred alternative

Response: Disagree. The analyses in Sections 2.4.1 through 2.4.10 and Chapter 4.0 are more than adequate to support the agency's preferred alternative. The rationale proposed is more suitable for the Record of Decision.

- 2. Comment:** Were cumulative impact considerations weighed in making a favorable determination for project development and were there specific qualifiers used to determine "acceptable limits"? Were agency obligations under the Endangered Species Act considered in choosing a preferred alternative? (18).
- Response:** Yes, the above factors and many others were weighed in choosing the agency preferred alternative. In addition to technical factors, BLM also considered its agency mission and national, state, and local policies regarding resource protection and development.
- 3. Comment:** Based on the above concerns, we would have to disagree with BLM with their selection of the Fruita I configuration at the 100,000-bpd production rate. The Clear Creek configuration at the 100,000-bpd production rate would appear to be a better alternative. The damages to and losses of the agricultural land are considerably less with this alternative. (21).
- Response:** It is correct that, for certain environmental impacts, major project configurations other than FI-100 are preferable. However, as cited above, BLM weighed many technical and policy factors in addition to supporting environmental impact analyses in choosing the agency preferred alternative. Damages to and losses to agricultural lands were but one consideration.
- 4. Comment:** Discussion of the No Action alternative should be expanded. Reasons why BLM did not choose the No Action alternative as the environmentally or agency preferred alternative should be more fully justified. (11, 16).
- Response:** BLM has decided not to choose the No Action alternative as that which is environmentally preferred, according to Council on Environmental Quality regulations and guidelines regarding EIS preparation (CEQ 1978, 1981). The environmentally preferred and Agency preferred alternatives are action alternatives, in view of BLM's mission. Further, the No Action alternative is adequately addressed in the EIS in accordance with the CEQ regulations. BLM has fully justified why it chose the environmentally preferred alternative, and therefore by inference has stated why it did not choose the No Action alternative. For example, BLM has stated that environmental impacts for FI-100 are acceptable given the committed mitigation by the Operator.

5.3.4 Air Quality and Meteorology

- 1. Comment:** What is the effect on aquatic animal and plant life of a pH shift to 6.0? (38).
- Response:** Although considerable research into the effects of acid precipitation on aquatic ecosystems has been performed in the northeastern United States, Canada, and Scandinavia, specific study of sensitive species in northwestern Colorado has not been performed. It is therefore unknown what specific effect potential atmospheric deposition might have on the biota of Flat Tops Wilderness. Additionally, the analyses reported in the EIS are conservative approximations to potential water chemistry changes; the results should be considered highly uncertain.
- In general, as aquatic systems are acidified, the resultant physiologic stress is likely to progressively alter biologic population structures. At the acidification levels reported (e.g., pH 7-6), elimination of certain phyto- and zooplankton species is possible (reducing diversity) but a significant change in total biomass is unlikely.
- 2. Comment:** The high background ozone levels noted within the project area were not addressed in the DEIS. (39, 53).
- Response:** The Air Pollution Control Division, Colorado Department of Health, provided clarification of elevated ozone values in northwest Colorado and the relationship to state and federal standards (Ostlund 1983). Their findings are summarized as follows.

The state ozone standard of 160 $\mu\text{g}/\text{m}^3$ was identical to the federal standard when adopted in 1978. The state ceased applying the 160 $\mu\text{g}/\text{m}^3$ standard when the federal standard was revised to 0.12 ppm (235 $\mu\text{g}/\text{m}^3$). Because the 0.12 ppm standard is not exceeded until 0.125 ppm is measured, the state now recognizes 245 $\mu\text{g}/\text{m}^3$ as the equivalent standard. The Colorado Ambient Air Quality Standards have not been revised to reflect this change.

When comparing monitored values to state and federal standards for regulatory purposes, two considerations are fundamental. First, evaluation of ozone standard violations relies on calculation of the "expected number of exceedences in a year" averaged over 3 years. Therefore, occasional monitored values exceeding the standard do not necessarily represent a violation of the health standard for ozone. Secondly, the validity of monitored data must be verified before values can be used for regulatory purposes. To date, the Air Pollution Control Division has not validated a single exceedence of the ozone standard in northwest Colorado. Offsets are only necessary if an ozone nonattainment area could be impacted by new source emissions.

Although no monitored values have violated the ozone standard, relatively high ozone values have been measured throughout northwest Colorado (BLM 1982b). Reasons for elevated values are unknown, but may include stratospheric intrusions due to turbulent mixing, long range transport from anthropogenic sources, and/or photochemical reactions of natural hydrocarbons.

3. Comment:

What is the impact on sensitive plant species, etc. at Colorado and Dinosaur National Monument? (32).

Response:

A preliminary evaluation of AQRVs conducted by the National Park Service, Air Quality Division (Bennet 1982) listed the following as "known or suspected plant species sensitive to ozone and sulfur dioxide" occurring in Colorado National Monument:

- | | |
|--------------------------------|-------------------------------|
| 1. <i>Allium</i> sp. | 6. <i>Pinus ponderosa</i> |
| 2. <i>Asclepias</i> sp. | 7. <i>Poa pratensis</i> |
| 3. <i>Fraxinus anomala</i> | 8. <i>Populus tremuloides</i> |
| 4. <i>Lupinus</i> sp. | 9. <i>Sphaeralcea</i> sp. |
| 5. <i>Oryzopsis hymenoides</i> | 10. Lichen species |

The list is only preliminary, not listing any animal AQRVs, nor evaluating the presence of sensitive, endangered and threatened species on federal or state lists. No similar evaluation has been performed in Dinosaur National Monument.

4. Comment:

Give more detail on the cumulative impact model inputs and assumptions. (26, 35).

Response:

The TAPAS modeling method used to determine cumulative impacts is state-of-the-art in regional scale, complex terrain modeling. Indeed there is uncertainty associated with any modeling analysis in complex topography, especially one which carries the analysis out to 200 kilometers from over 20 sources whose detailed emission characteristics can only be speculated. Model results should be viewed as uncertain, however every effort was made to bracket the worst possible situation in a conservative analysis.

Worst-case analyses, such as the one used, will estimate high pollutant concentrations since worst-case emission, source siting, and meteorologic assumptions are used. Although all models have certain limitations, the results represent a best approximation of potential worst-case impacts under the conditions assumed. These analyses are performed to provide an indication of potential problem areas and ranges are provided to indicate the uncertain nature of the predictions.

EPA modeling guidelines (EPA 1978c) and proposed revisions do not recommend any specific model in complex terrain nor on a regional scale for regulatory purposes. In general, VALLEY is suggested as a screening technique with COMPLEX I or COMPLEX II as suitable replacements. These "straight line" models assume persistent wind conditions at the

source and hold these conditions constant over the entire plume trajectory. These models are also not suggested for trajectories over 50 kilometers. Exclusive application of these models for this EIS would be inappropriate.

The EPA has tentatively approved use of a model similar to TAPAS for evaluating PSD permits in a specific situation (47 FR 42806). Also, CEQ regulations (40 CFR 1502.24) for implementing NEPA requirements emphasize "scientific integrity" but do not require use of regulatory models.

Since there is no EPA approved/verified air quality model applicable for analysis in complex terrain or on a regional scale (as encountered in western Colorado), a modeling approach was selected which applied best scientific and professional judgment to perform adequate assessments. TAPAS was selected because: (1) it is applicable in complex terrain; (2) it can model multiple emission sources; (3) it utilizes terrain influenced pollutant trajectories; (4) it is suitable for the regional scale (50-200 kilometer transport distances); (5) it is applicable for worst-case analysis; and (6) similar versions of the models have been applied by regulatory agencies in specific situations. Hence, the best available predictive tools were used.

For pollutants to reach regional PSD Class I areas, long transport is necessary. Conditions likely to cause the highest level of pollutants at these sensitive receptors would include light, persistent winds under moderately stable to stable conditions with a moderate mixing depth. Winds of 4 meters per second from the west-southwest under "Class E" stability was assumed as the worst-case meteorologic scenario.

Although not a frequent occurrence, Systems Applications, Inc. (1982) analysis of actual meteorologic data suggest 24 hour wind persistence is not an unrealistic assumption and is indeed worst-case. Wind persistence of 10 hours is likely based on data collected in the Piceance Basin. Taking this into consideration, the EIS contains ranges of concentrations assuming fixed 10 to 24 hour wind patterns.

"Class E" stability should be sufficient for limiting vertical dispersion under the mixing depth assumed. An excessively high mixing height will allow excessive dispersion. But equally critical, too low of a mixing height will isolate elevated plume sources from reaching the ground. Plume rise must also be selected to minimize dispersion prior to transport, but also avoid undue proximate impacts. The dispersion parameters selected for these conditions are those generally used by the EPA to model in complex terrain.

Regarding wind shear effects, the model assumes that at the top of the mixing layer the vertical velocity is zero, and that at ground level the vertical velocity component is given by a flow parallel with the surface. This approximation fails in areas where the topography is particularly steep because unrealistically large velocities parallel to the surface are generated, resulting in high divergence (or convergence) fields. Physically, such a phenomena is unrealistic since, as the commenter observes, vertical winds (other than simply parallel to the topography gradient) would be operative, as well as a host of other physics not included in the model. The TAPAS analysis is overly conservative in such limited situations.

In summary, predicted cumulative impact results must be evaluated with an understanding of the general limitations of air quality modeling in complex terrain — uncertainties of an order of magnitude could be expected. The analyses performed were designed to provide conservative estimates rather than average values. Therefore, the worst case assumptions and computer results expressed in this environmental statement should not necessarily be construed as a basis for "no action." However, high pollutant concentrations do indicate potential air quality problem areas.

5. Comment: Clarify the cumulative impact analysis presentation. (16, 26).

Response: The Air Quality and Meteorology Cumulative Impacts Section (4.14.2) has been revised to incorporate comments.

6. Comment: The pH shift identified in the DEIS violates State Water Quality Standards. (53).

Response: Accepted methods for estimating incremental effects of emission sources on atmospheric deposition and acidification currently do not exist. The deposition modeling results presented in the DEIS are a conservative approximation to potential water chemistry changes. Although comparisons may be made, it would be improper to use these results for enforcement purposes. The results must be considered extreme "worst-case" and highly uncertain; considerable improvements in atmospheric deposition modeling are anticipated in the future.

Additionally, it is uncertain whether the Colorado Water Quality Control Commission's regulations establishing basic (numeric) and antidegradation water quality standards are applicable for modeled or monitored atmospheric deposition impacts (Nazaryk 1983). The Bureau of Land Management will continue to cooperate with the state in order to clarify the regulations' applicability in the planning process.

7. Comment: If hydrocarbon data from other sites in the region are available, these should be compared to determine the representativeness of Chevron's 1981 data. (39).

Response: Since hydrocarbons (HC) are not a regulated pollutant, regional measurements are not available.

8. Comment: Air quality support documents cited are not available. (32, 46, 53).

Response: CEQ Regulations (40 CFR 1502.21) specify:

"Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described"

All documents so incorporated were and are publicly available at the BLM Grand Junction Office, including the PSD applications.

9. Comment: How was the 6 $\mu\text{e}/\text{l}$ value calculated and what assumption is this calculation based on in the PA-100 alternative acid deposition section. (18).

Response: See revised Section 4.2.2, under heading "Atmospheric Deposition".

10. Comment: A cumulative ozone analysis should be presented in the FEIS. (26, 39).

Response: The CCOSP EIS estimates the site specific ozone impacts due to each alternative and predicts no significant ozone impact.

A regional study of the cumulative impacts from proposed oil shale and power plant facilities was conducted in the Unita Basis Synfuels Development FEIS (BLM 1983). The results of the high production level scenario (320,500 bbl/day synfuel totals) indicate that oil shale development would not lead to exceedence of the federal 1-hour ozone standard of 235 $\mu\text{g}/\text{m}^3$.

11. Comment: The air quality impacts of the project and cumulative impacts on recreation, agriculture, and other sensitive groups need to be addressed in more detail in the FEIS. (5, 36, 38, 39, 52, 53).

Response: See revised Appendix B-2.

12. Comment: Tables presenting air quality emissions data may be confusing to the general public. (12).

Response: See revised tables in Section 4.2. Emission values used for the regional cumulative analysis were provided in the DEIS (Table 4.14-1). A mere comparison of emission rates does not

adequately identify the probable impacts to air quality. For that purpose, extensive dispersion modeling was performed and results provided in the DEIS.

- 13. Comment:** Air quality mitigation measures should be discussed in the FEIS. (5, 36, 42).
- Response:** Committed mitigation measures to control air pollution emissions from the mining, retorting and upgrading facilities are thoroughly discussed in Section 3.0 BACT (Best Available Control Technology) of the two PSD applications for these facilities. The documents are available for review at the BLM, Grand Junction office. These control measures include both add-on control devices such as scrubbers and baghouses, as well as process controls.
- 14. Comment:** The measured maximum ambient lead concentration is 10 ng/m³ on Clear Creek mesa. (16).
- Response:** Concur.
- 15. Comment:** Section 3.2.2 states that acid deposition modeling has not been performed, nevertheless the analysis is presented in Section 4.2.2. (16).
- Response:** Concur. Text has been corrected to reflect this.
- 16. Comment:** Emissions from the proposed 300 megawatts power plant have not been included in the analysis of the air quality impacts of the project. (52).
- Response:** A 500 megawatts power plant for generating sufficient power to operate the CCSOP was assumed to exist and the emission from the Southwest Power Plant were included in the cumulative air quality analysis.
- 17. Comment:** Multi-day EKMA modeling runs should be made to simulate the multi-day inversions documented for the region. (39).
- Response:** The EKMA algorithm cannot accurately simulate nighttime scenarios. Nevertheless, ratio of reactive hydrocarbons to total oxides of nitrogen yields significant ozone scavenging from reaction with the NO.
- 18. Comment:** The CCOSP EIS should address air quality impacts due to secondary growth. (5, 49).
- Response:** The CCOSP EIS does address secondary air quality impacts in Section 4.2.7 and recognizes that secondary growth will result in air quality impacts.
- 19. Comment:** Please provide wind roses representative of the Fruita and Clear Creek Mesa areas. (46).
- Response:** Figures 5.3-3 and 5.3-4 are wind roses which were used in the modeling analyses. Sites B and C are located on Clear Creek mesa, while Grand Junction data is from Walker Field.
- 20. Comment:** Clarify the TSP nonattainment analysis for the FI-100, FI-50, and FII-50 alternatives and provide information on projected increases in particulates. (5, 17, 26, 49).
- Response:** The Mesa County East-West nonattainment boundary (See Figure 4.14-1) crosses the Grand Valley about 1.5 miles north of and includes the town of Fruita. The boundary is 5.5 miles south of, and thus excludes the upgrading facility. The modeling analysis predicts values at this nearest nonattainment boundary to be well below EPA levels of significance criteria for the FI-100 alternative and equal to these criteria for FII-50, and therefore should not significantly aggravate the Mesa County nonattainment problem.
- Secondary particulate emissions due to secondary growth is described in Section 4.2.7.
- 21. Comment:** The EIS should address the potential impact of fine particulates (less than 10 microns) and the potential health effects. (5, 47).

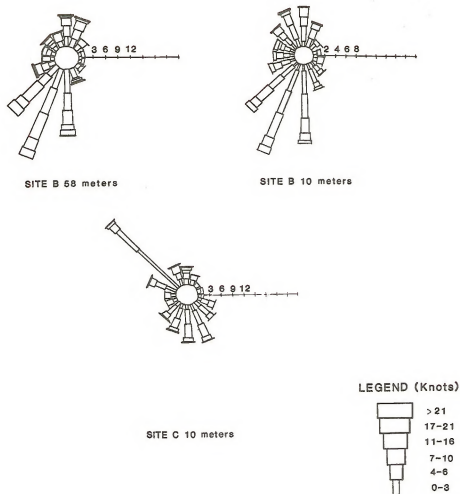


Figure 5.3-3 Annual Wind Speed and Direction Frequencies for Sites B and C.

- Response:** A detailed analysis of the fine particulates for alternatives is beyond the scope of this EIS and beyond current technological capabilities to be resolved conclusively. Some particle size analysis was considered in the Industrial Source Complex modeling for mining and other surface disturbances. For a detailed discussion of this modeling please refer to Chevron (1982d,f). Other particle emissions related to combustion sources would primarily consist of fine particles. As noted in the comment, health effects from particulates are mostly associated with the fine fraction. EPA is in the process of establishing a standard for regulating the fine particulates in order to adequately protect public health and welfare.
- 22. Comment:** Models used should be validated with existing data to compare current violation in affected population centers with estimated secondary air quality degradation. (49).
- Response:** A model validation study is beyond the scope of this EIS. Continuing attention to this general issue is being given by the regulatory agencies and will be assessed by the BLM.
- 23. Comment:** The ozone analysis should include a combined impact at the mesa site due to the Grand Valley upgrading facility. (26).
- Response:** The ozone analysis performed indicates that no significant effect is likely when combining Grand Valley upgrade ozone impacts with Clear Creek mesa retorting and mining impacts.

This is based on the hydrocarbon to oxides of nitrogen (HC/NO_x) ratio necessary for significant oxidant formation. Predictions for this area indicate the predicted HC/NO_x ratio is far from the range necessary to significantly increase ozone concentrations in the area. (Chevron 1982d, 1983f).

- 24. Comment:** The Union project production rate should be 90,000 bpd rather than 10,000 bpd. (44).
- Response:** The cumulative air quality analysis included analyses of the Union project at a production rate of 90,000 bpd. However the cumulative acid deposition analysis considered the Union Project at a production rate of 10,000 bpd, based on the best available data.
- 25. Comment:** The secondary impacts section (4.2.7) should include wood and coal burning as potential sources of residential heating. (5).
- Response:** Study results are currently too preliminary in nature to be included in the EIS. Undoubtedly, increase residential wood and coal combustion will aggravate air quality impacts.
- 26. Comment:** Has Gary Western Refinery been considered in the air quality analyses. (5, 46).
- Response:** Gary Western Refinery pollutant emissions contribute and are part of the monitored background values. No changes in their emissions were assumed in this analysis.
- 27. Comment:** A description is not provided in Appendix B-2 on how emission factors for the scaled-up retorting and upgrading facilities were derived. (39).

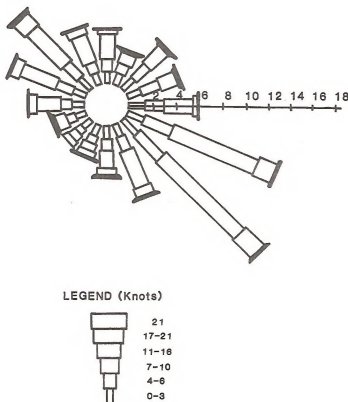


Figure 5.3-4 Wind Frequency Distribution Plot for Grand Junction, Colorado (1977-1981).

- Response:** The emission rates are indeed estimates for a new technology which have been scaled up from actual emissions of a much smaller pilot plant, but are comparable to similar technologies. Also, the Operator has committed to these emission rates as described in its two PSD applications. Thus, these emission rates may be lower, but cannot be higher.
- 28. Comment:** Please provide inversion height and mixing layer data representative of the area. (46).
- Response:** Mixing heights and inversion heights are documented in Section 4.0 of the PSD applications for mining and retorting on Clear Creek mesa (Chevron 1982d) and upgrading in Grand Valley (Chevron 1982f).
- 29. Comment:** An acid deposition analysis identifying areas of the greatest potential impact should be conducted. (39).
- Response:** The Class I areas were selected as potentially the most sensitive areas and should serve as "indicators" for the region. The analysis performed is based on first-order chemical reactions and should be considered rudimentary "worst-case" and approximate. Without some detailed water chemistry data, the analysis would be even less meaningful.
- 30. Comment:** The visibility analyses should include in its simulation the following: effects of climatological deviations, multi-day stagnation, moderate to extreme stability conditions, shifting arrival times, reduced wind speeds, and coincidental plumes. (30).
- Response:** The visibility analysis is based on the best available data and current analysis methodology in the form of the EPA Workbook for Estimating Visibility Impairment (Ireson and Latimer 1980) and the EPA Plume Visibility Model PLUVUE (USEPA 1980d). The technology does not exist which allows for climatological deviation, shifting arrival times and coincident plumes within a reasonable degree of reliability.
- 31. Comment:** It is not clear in the DEIS whether cumulative visibility analyses were performed for the CCSOP. If the analyses were performed, how were they done. (39, 53).
- Response:** Although there is no scientifically accepted method for assessing potential cumulative visibility impacts from several sources, one method of evaluation would be to perform a conservative level I screening analysis for each potential source in the region. Rather than evaluate the potential impact to a specific receptor, the model may be applied to determine the minimum distance beyond which it is "highly unlikely that the emissions source would cause adverse visibility impairment — further analysis of potential visibility impacts would be unnecessary." Because the level I screen applies worst-case assumptions, it should *not* be inferred that the emission source will *necessarily* impact visibility within the distance modeled; further detailed analysis is required to refine the degree of impact.
- Table 5.3-2 indicates the minimum distance beyond which visibility impairment from each individual source is "highly unlikely." Assumed production levels and the pollutant primarily responsible for the modeled impact are also presented. NO_x impacts would generally result in dark colored NO_x plumes against the sky, whereas TSP impacts would result in light colored plumes against terrain.
- 32. Comment:** The visibility analysis should indicate all sensitive receptors of likely public awareness from the separate facilities. (16, 26, 39, 52).
- Response:** Concur. See response to Comment No. 31.
- 33. Comment:** Environmental benefits from NO_x technology should be discussed. (53).
- Response:** The level of analysis for addressing the benefits of various technologies is adequate for the purposes of the CCOSP EIS. Information concerning control measures as regards economic, environmental, and energy consideration will be further refined in the regulatory process.

Table 5.3-2 MINIMUM DISTANCE LEVEL I SCREEN PASSES

Source	Production Level ^a	Responsible Pollutant	Distance (km)
Cathedral Bluffs	76	NO _x	101
Chevron-retort	100	NO _x	134
-upgrade	(100)	NO _x	49
-combined	100	NO _x	147
Chevron-retort	50	NO _x	92
-upgrade	(50)	NO _x	33
-combined	50	NO _x	101
Colony	48	NO _x	55
Mobil	50	TSP	64
Rio Blanco	100	TSP	79
Superior-Pacific	15	TSP	24
Union	90	TSP	87
Craig Power	1,340	NO _x	112
Hayden Power	465	NO _x	60
S.W. Power	500	NO _x	68
Enercor-Rainbow	5	TSP	13
Paraho-Ute	42	TSP	46
Syntana	57	TSP	55
Western	5	TSP	17
White River	100	TSP	68
Moonlake Power	800	NO _x	99

Source: Archer (1983).

^a Synfuel production in 1,000 bbl/day; power production in megawatts.

34. Comments: TOSCO's Sand Wash and MagicCircle's Cottonwood projects have not been addressed in the cumulative air quality impact section. (12).

Response: The TOSCO Sand Wash and MagicCircle Cottonwood projects are beyond the modeling boundary of the CCOSP EIS project. More information on the air quality impacts of these projects can be found in the Air Quality Technical Report Document to the UBS Oil Shale Leasing Program FEIS (SAI 1983).

35. Comment: New control technologies should be investigated. (53).

Response: Advance technology comparisons are more appropriately considered and regulated by the Clean Air Act and the New Source Review program. BLM did evaluate the information presented concerning the available control technologies and deemed it adequate for EIS purposes. For purposes of NEPA and the EIS, the BACT discussion provided by the Operator presents an adequate level of consideration of available and proven control technologies. Additional controls lowering the total emissions assumed in the EIS would result in commensurately lower air quality.

36. Comment: An analysis of the impact of each pollutant on soils and vegetation should be provided. (39).

Response: The analyses of air pollutant impacts on soils and vegetation has been provided in Chapter 5 of both PSD applications (Chevron 1982d,f) and are summarized in Appendix B-2 of the EIS.

37. Comments: Provide more information concerning a materials balance of trace elements, and additional trace element analysis for combusted off gas and combusted spent shale. (44).

- Response:** Trace elements generally cannot be balanced because of the lack of consistent data available as a starting point. Further, the detection limits of many elements precludes performing a material balance. Additional trace analyses for combustor off gas and combusted spend shale are given in (Tables 5.3-3, 5.3-4, and 5.3-5). Trace metal analysis showed most metals in the raw shale remain in the spent shale. Regarding sulfur emissions, the information contained in the PSD applications as supplemented is adequate for EIS analyses.
- 38. Comment:** The BLM should provide lease stipulations in the form of operation aerometric monitoring. (39, 42).
- Response:** The BLM is satisfied that the data provided is adequate for the environmental impact assessment.
- 39. Comment:** A more detailed BACT discussion should be included in the FEIS. (26, 46, 53).
- Response:** A full BACT analysis and discussion is presented for the mine and retort facilities in Section 3.0 of the CCOSP Mining and Retorting Facility PSD Application (Chevron 1982d) and for the upgrading facility in the CCOSP upgrading in Grand Valley PSD application (Chevron 1982f) which are incorporated by reference. Tables 5.3-6, 5.3-7, and 5.3-8 provide a summary of BACT methods and assumed control efficiency.
- 40. Comment:** The dispersion models used in the air quality impact analysis have been accepted by EPA for certain uses. However, these models are *not* officially approved models. (44).
- Response:** Concur. See revised Section 4.2.1, Air Quality and Meteorology, General Impacts.
- 41. Comment:** Consideration of employee health and safety should be provided in the FEIS. (39).
- Response:** The Operator will be required to comply with all applicable regulatory requirements including providing for the protection for the workers. Operator has provided additional assurance (Chevron 1983c) that worker safety will be provided.

Table 5.3-3 CHEMICAL ANALYSIS OF COMBUSTOR OFF GAS

Analysis	Concent. (ppm)	Lower Detec. Limit (ppm)	Method
Pb	0.20	.20	ICP Metals Analysis
Be	0.002	.002	ICP Metals Analysis
Ba	0.0013	.013	ICP Metals Analysis
Cr	0.015	.015	ICP Metals
Cd	0.009	.009	ICP Metals
Mo	0.015	.015	ICP Metals
B	0.081	.081	ICP Metals
Cu	0.015	.015	ICP Metals
Fe	0.009	.009	ICP Metals
Ni	0.10	.10	ICP Metals
Zn	0.009	.009	ICP Metals
As	0.002	.0002	Neutron Activation
Se	-	4.0	Neutron Activation
Ag	-	5.0	Neutron Activation
Sb	0.002	.0002	Neutron Activation
Organics	10	10.	GC

Source: Chevron (1983b).

^a For ICP Metals Analyses, one sample run 3 times.

Table 5.3-4 CHEMICAL ANALYSIS OF COMBUSTED SHALE (NET COARSE)

Analysis	Concent. (ppm)	Stand. Dev. ^a	Lower Limit (ppm)	Detect. Method
Pb	100	1.5%		ICP Metals Analysis
Be	3.3	2.2%		ICP Metals Analysis
Ba	550	0.2%		ICP Metals Analysis
Ba	22	4.		Neutron Activation
Cr	18	0.9%		ICP Metals
Cr	35.5	4.		Neutron Activation
Cd	4.3	0.6%		ICP Metals
Mo	34	1.1%		ICP Metals
Cu	45	0.7%		ICP Metals
Fe	2.42%	0.5%		ICP Metals
N	21.5	3.9%		ICP Metals
Zn	68.7	0.8%		ICP Metals
Hg	2	-	2	Neutron Activation
F	4,700	200	2,000	Neutron Activation
As	42	2	2	Neutron Activation
Se	9	0.1	4	Neutron Activation
Ag	30	20	5	Neutron Activation
Sb	14	5	0.5	Neutron Activation
TOC	1,300			GCMS
Phenols	1	1		GCMS
PNA's	1	1		GCMS

Source: Chevron (1983b).

^a For ICP Metals Analyses, 1 sample run 3 times. Relative standard deviation for method, % for neutron activation, 4 samples run 1 time each. Standard deviation for sample preparation + method, ppm.

42. Comment: The FEIS should include a malfunction and upset condition air quality impact analysis. (26, 53).

Response: Chevron (1983c,d) has committed to not operate any of the facilities during malfunctioning or upset conditions.

43. Comment: Additional information concerning odor emissions and controls should be provided in the FEIS. (7).

Response: The CCSOP is designed to minimize odorous release (Chevron 1983b). Many of the BACT units such as the Waste Water Treater (WWT) and Sulfur Recovery Units (SRU) control potential odorous releases. Odor control teams operate within each process area to detect and locate releases. This program has been very effective in California refineries.

Odor emissions vary based on the geographic area or whether a manufacturing or agricultural process is involved. It is a violation if an odor can be detected after the dilution of the odorous air with 7 volumes of odor free air for commercial and residential areas, and 15 volumes for other areas. An exception is provided if the source is a manufacturing process using the best practical control method provided that the maximum emission rate is not exceeded. Odor must not be detectable in any case if one volume of odorous air is mixed with 127 volumes of odor free air.

44. Comment: The site location must be sufficient to achieve compliance with total suspended particulate standards at the property boundary. The sentence on "The site location . . ." on page 2-63 should be deleted. (16).

Response: Based on analysis presented, spent shale particulate impacts would be of a sufficient quantity that public access of nearby lands would need to be limited.

Table 5.3-5 CHEMICAL ANALYSIS OF COMBUSTED SHALE FINES

Analysis	Concent. (ppm)	Stand. Dev. ^a	Lower Detec. Limit (ppm)	Method
Pb	79	3.8%		ICP Metals Analysis
Be	3.1	1.1%		ICP Metals Analysis
Ba	400	0.1%		ICP Metals Analysis
Ba	21	2		Neutron Activation
Cr	16	4.9%		ICP Metals
Cr	33	3		Neutron Activation
Cd	4.8	0.3%		ICP Metals
Mo	35	1.6%		ICP Metals
Cu	49	0.1%		ICP Metals
Fe	2.32%	0.1%		ICP Metals
Ni	22.8	2.4%		ICP Metals
Zn	68.1	0.4%		ICP Metals
Hg	2	-	2	Neutron Activation
F	4,400	400	2,000	Neutron Activation
As	59	6	2	Neutron Activation
Se	5	1	4	Neutron Activation
Ag	72	36	5	Neutron Activation
Sb	18	2	0.5	Neutron Activation
TOC	1,200			
Phenols	1	1		GCMS
PNA's	1	1		GCMS

Source: Chevron (1983b).

^a For ICP Metals Analyses, one sample run 3 times. Relative standard deviation for method, % for neutron activation, 4 samples run once each. Standard deviation for sample preparation + method, ppm.

45. Comment: Compare buses versus car pooling emission values and their effects on air quality. (16).

Response: Buses, compared to cars, present less air quality impacts as shown in Table 5.3-9. These values were calculated for 5,125 workers (BMML 1982) traveling 28 miles/day from De Beque to the plant site. The heavy duty diesel buses are assumed to carry 40 passengers, the light-duty diesel buses are assumed to carry 40 passengers, and the light-duty vehicles are assumed to carry 2.8 passengers. Emissions factors are from EPA (1978a) Tables HI-IV-1 (HDD) and HI-I-1 (LDV for HC, CO and NO_x; the SO_x and TSP are standard AP-42 values).

46. Comment: Under air quality no specific mitigation is proposed; however, it should be recognized that at all times during construction and operation, CCSOP is required to conduct its activities in accordance with all applicable air quality statutes, laws, and regulations; and all required permit applications and reviews that include BACT and emission limitations. CCSOP would not operate in upset conditions for a prolonged period. Consistent with Chevron's practices nationwide, CCSOP would notify the appropriate agency that upset/malfunction is occurring and Chevron's approach to correcting this condition. Personnel safety would not permit operating many units in upset mode. (16).

Response: Concur.

47. Comment: The highest background value of 121 µg/m³ for TSP needs to be corrected using the second highest value. (16, 26).

Response: Concur. See revised Section 4.2.2.

Table 5.3-6 BACT FOR MINING AND MATERIALS HANDLING

BACT	Assumed Control Efficiency (%)
Topsoil Removal	.3
Watering	50
Mulch	85
Drilling	
Water Injection	75
Bank Sprays	50
Chemical Suppressant	85
Crushing	
Baghouse	99.9
Conveyor	
Fully enclosed with cyclones at transfer points	94
Stockpile	
Stacker	25
Underground reclaim	85
High Moisture Content	70-99
Enclosure	75-85
Wind Break	50

Source: Chevron (1982d).

* Best Management Practice will be applied. The control efficiency is not quantified and 0% efficiency was assumed in developing the emission.

Table 5.3-7 BACT FOR THE PROPOSED RETORTS

Pollutant	BACT	Emissions Limit
TSP	3 stage cyclones and baghouse	0.03 gr/SCF
CO, HC	Long residence time for combustion, excess oxygen	1,000 ppm 20 ppm
NO _x	Low combustion temperature, staged combustion	300 ppm
SO _x	Process chemistry	20 ppm
SO _x	Process Gas: Stretford absorbers Low Sulfur Fuel Oil (Steam Generators)	0.04 lb/MMBTU 0.3 lb/MMBTU
NO _x	Minimize fuel consumption, low excess air, low NO _x burners where appropriate *	gas fired: 0.13 lb/MMBTU oil fired: 0.3 lb/MMBTU
TSP, CO, HC	Proper furnace design, oxygen control	
TSP	Source R-1: cyclones and baghouse	0.02 gr/SCF
TSP	Baghouses	0.02 gr/SCF

Source: Chevron (1982f).

Table 5.3-8 BACT FOR THE PROPOSED UPGRADING FACILITY

Pollutant	BACT	Emissions Limit
SO _x	Fuel Gas: scrubbers Diesel Fuel: hydrotreating	0.04 lb/MMBTU
NO _x	Minimize fuel consumption, low excess air, low NO _x burners for furnaces greater than 40 mm btu/hr.	gas fired: 0.2 lb/MMBTU oil fired: 0.3 lb/MMBTU
TSP, CO, HC	Proper furnace design, oxygen control	
SO _x	Limestone scrubber	0.19 lb/MMBTU
NO _x	Minimize fuel consumption, low excess air, low NO _x burners	0.7 lb/MMBTU
TSP	Baghouses	0.03 lb/MMBTU
CO, HC	Proper furnace design, oxygen control	
Pb	Baghouses	
SO _x	Beavon sulfur removal unit or equivalent	250 ppm
H ₂ S	Beavon sulfur removal unit or equivalent	10 ppm
COS & CS ₂	Beavon sulfur removal unit or equivalent	240 ppm
CO	Catalytic shift converter	100 ppm
TSP	Baghouses	0.02 g/SCF

Source: Chevron (1982f).

Table 5.3-9 VEHICULAR EMISSIONS (TPY) PROPOSED ACTION

Type	HC	CO	NO _x	SO _x	TSP
HDD-bus	4	9	8	4	2
LDV-car	144	212	39	3	7

Source: Chevron (1983b).

48. **Comment:** Clarify receptor 177 and 178 receptor locations as part of the nonattainment impact analysis. (39).
- Response:** See revised Section 4.2.3.
49. **Comment:** Total impacts from the three facilities should be addressed cumulatively, instead of independently. (26).
- Response:** See the revised Section 4.2.2.
50. **Comment:** Impacts due to retorting and upgrading facility emissions located on the Clear Creek mesa should be analyzed for Colorado National Monument. (32).
- Response:** See the revised Section 4.2.2, PA-100 subsection.
51. **Comment:** If Chevron does not provide test data that are considered to be both valid and representative of full-scale operating conditions, then worst-case analyses must be performed. (39).
- Response:** Concur.
52. **Comment:** Gaseous, NO_x emissions from the surface and underground mine were not modeled. (26).
- Response:** See revised Sections 4.2.2 and 4.2.3.
53. **Comment:** There has been no modeling analysis which addressed ozone formation in the region. (53).
- Response:** See the revised Sections 4.2.2 and 4.2.3.
54. **Comment:** No CO or TSP impacts were presented. (49).
- Response:** See revised Section 4.2.7.
55. **Comment:** Ozone impacts for each alternative have not been discussed. (16, 26, 39, 53).
- Response:** See revised Section 4.2.2, Air Quality subsection, and Section 4.2.3., Fruita II Alternative (FII-50) Air Quality subsection.
56. **Comment:** Total NO_x was modeled for all alternatives and then compared to NO₂ which only makes up part of the total oxides of nitrogen. (16).
- Response:** See revised Section 4.2.2, Air Quality subsection.
57. **Comment:** Two different models were used to predict impacts from mining and retorting sources. No model was run which predicts the cumulative impact from both sources. The reader is unable to understand the effect of the alteration without this information. (39).
- Response:** See revised Air Quality section, under Sections 4.2.2 and 4.2.3.
58. **Comment:** Discuss representativeness of Walker Field data for use as modeling input. (39).
- Response:** See revised Section 4.2.3, Air Quality subsection.
59. **Comment:** The over prediction of air quality impacts from using conservative modeling assumptions needs additional explanation. (4, 16, 38, 39).
- Response:** See revised Section 4.2.1.
60. **Comment:** The conservative nature of significant visibility impact obtained from PLUVUE results needs additional explanation. (39).

- Response:** See revised Sections 4.2.2 and 4.2.3, Visibility subsection.
- 62. Comment:** How many sources were included in the Fruita II visibility analysis? (53).
- Response:** See revised Section 4.2.3, Visibility subsection.
- 63. Comment:** An analysis of visibility impacts on Flat Tops and Arches National Park due to retorts alone as well as with the upgrading facilities needs to be provided in the FEIS. (16).
- Response:** See revised Sections 4.2.2 and 4.2.3, Visibility subsection.
- 64. Comment:** Table 2.3-5 of the DEIS indicates that 250 ppm SO₂ emission in the tail gas is BACT. This level of control does meet the NSPS emission limit for sulfur recovery plants. However, some additional control might be achievable. (44).
- Response:** Concur.
- 65. Comment:** Impact analysis of the Proposed Action (PA-100, CC-100) does not sufficiently address visibility, ozone, and TSP concentrations and their effects on human health, air, water and biota. (39).
- Response:** See revised Section 4.2.2.
- 66. Comment:** Ozone impacts should be addressed for the mine and retort facilities. (16).
- Response:** See revised Section 4.4.2.
- 67. Comment:** A much more detailed air quality impact section must be presented in the FEIS. (36).
- Response:** See revised Sections 4.2.1 through 4.2.7.
- 68. Comment:** Will hydrocarbon emissions due to the oil shale facility result in air quality impacts? (4).
- Response:** See revised Sections 4.2.2 and 4.2.3.
- 69. Comment:** Are TSP impacts discussed in the DEIS? (4).
- Response:** See revised Section 4.2.2 and 4.2.3.
- 70. Comment:** Air quality impact tables should include baseline concentrations. (16).
- Response:** See revised Sections 4.2.2 and 4.2.3.
- 71. Comment:** Annual emissions for SO_x, NO_x, and CO need to be provided in Table 4.2-1. (17).
- Response:** Concur. See revised Section 4.2.2, Table 4.2-1.
- 72. Comment:** Air quality impact receptor locations need to be provided in the FEIS. (17).
- Response:** See revised Sections 4.2.2 and 4.2.3.
- 73. Comment:** Clarify in the FEIS that the Fruita upgrading site is not within the Mesa County TSP nonattainment boundary. (16).
- Response:** See revised Section 4.2.3.
- 74. Comment:** "Receptor N84" should be "receptor R84". (16).
- Response:** Concur. See revised Sections 4.2.2 and 4.2.3.

- 75. Comment:** The FII-50 production levels need to be clarified in the FEIS. (16, 52).
- Response:** See revised Section 4.2.3, FII-50 Alternative subsection.
- 76. Comment:** The PSD application emission inventories should be used where applicable. (26).
- Response:** Concur. See revised Sections 4.2.2 and 4.2.3.
- 77. Comment:** The air quality impacts of the alternatives should be compared. (26, 36).
- Response:** Concur. See revised Sections 4.4.4 and 4.2.3.
- 78. Comment:** The air quality impact tables should designate exceedence of federal and state standards and should be pointed out in the associated text. (17, 44).
- Response:** See revised air quality impact tables in Sections 4.4.2 and 4.2.3. Further, Section 2.4.3 should be revised to read as follows:
- Potential air quality impacts for the alternative project configurations are strongly influenced by the location of the facilities with respect to critical receptors and phase of the project. Generally, construction activities for all configurations would produce a temporary, site-specific, low adverse impact due to fugitive dust and mobile sources. Assuming adequate reclamation of disturbed areas, only slight adverse air quality impacts from windblown fugitive dust would result during the residual phases.
- During operations, the PA-100/CC-100 alternatives rate the highest impacts due to a predicted exceedence of the annual federal nitrogen dioxide (NO₂) standard as well as consumption of the 24-hour total suspended particulate (TSP) Class II increment. Additionally, visibility impairment is also predicted. For FI-100, all impacts are predicted to be within current standards. Maximum predicted impacts are from TSP approximately 6-kilometers north of the mine. FI-50 generally rates the least adverse impact on air quality. FII-50 would have a high adverse impact on visibility and the Mesa County TSP nonattainment area. The PA-50/CC-50 alternatives indicate low to moderate adverse impacts on air quality. Some visibility impairment may also occur. See revised Section 4.2, Air Quality and Meteorology, for further discussion.
- 79. Comment:** A more detailed visibility impact analyses due to the alternatives should be included in the FEIS. (16, 32, 39).
- Response:** See revised Sections 4.2.2 and 4.2.3, Visibility subsections.
- 80. Comment:** What is the "Western" project presented in Table 4.14-4? (12, 17, 52).
- Response:** See revised Section 4.14.2.
- 81. Comment:** Further explanation of atmospheric deposition impacts for the three alternatives is needed in the FEIS. (16, 17).
- Response:** Concur. See revised Section 4.2.2 and 4.2.3.
- 82. Comment:** The FEIS should contain a cumulative analysis for the FI-50, FII-50, and FI-100 alternatives as well as for acid deposition for all alternatives. (39, 52).
- Response:** Concur. Section 4.1.1.2, Cumulative Impacts, has been revised to incorporate these comments.
- 83. Comment:** Worst-case analyses for metals should be based on vaporization temperatures for each species, the known concentrations of the metals in the ore, capture efficiency of TSP control devices given assumed stack temperatures and know vaporization temperatures, and other factors which would limit the release of metals into the atmosphere from the process. (39).

- Response:** Current technology and available data are inadequate to perform this type of analysis with any degree of reliability.
- 84. Comment:** Under the NEPA case law, it is not enough for the BLM to simply adopt a BACT analysis in the PSD application by reference. The applicant's conclusions must be independently evaluated by the BLM, and the basis for the agency's conclusions must be explained. (39).
- Response:** BLM did evaluate the information presented concerning BACT in the PSD applications and deemed it adequate for EIS purposes. As part of the regulatory process, permitting agencies will independently review the control technologies proposed and solicit public comments. The concepts of cooperating agencies and use of their expertise and incorporation of voluminous material by reference in the EIS are supported in CEQ NEPA regulations at 40 CFR 1501.6 and 1502.21, respectively.
- 85. Comment:** There is no cumulative air quality impact analysis for the Colorado Category I area of the Colorado National Monument. (26).
- Response:** The FI-100 configuration represents the worst case for cumulative air quality impacts in the analysis area to regional topography and meteorology.
- 86. Comment:** The DEIS does not estimate NO_x concentrations in Colorado Nation Monument, even though the NO_x standard is estimated to be exceeded under the proposed action. (32).
- Response:** The NAAQS violation is estimated for total oxides of nitrogen (NO_x) due to retorting on Clear Creek mesa. Transport to Colorado National Monument as described in revised Section 4.2.2 is highly unlikely with pollutant concentrations estimated well below EPA levels of significant impacts. Additionally, as noted in Section 4.2.2, the facility configuration for the proposed action shows significant adverse impacts in the immediate area, hence further analyses were not initially performed. However, in response to this comment, land calculations based on Turner's workbook indicate that under worst case conditions, NO_x concentrations at Colorado National Monument would be approximately 35 percent of the annual standard.
- 87. Comment:** There has been no discussion of toxic pollution emission from the oil shale facilities and their respective impacts.
- Response:** See revised Section 4.2.6, Solid and Hazardous Waste.

5.3.5 Water Resources

5.3.5.1 Surface Water

- 1. Comment:** The levels of added salts to the Colorado River system from the CCSOP should be evaluated. (4).
- Response:** The levels of added salts to the Colorado River system are limited to the runoff from the Roan Creek valley access road. The Roan Creek reservoir is not expected to add salt loading to the Colorado River system. However, water withdrawals from the Colorado River may increase the salinity concentration in the river system. Impacts of this increased salinity concentration are addressed in Section 4.4.1.2 of the FEIS.
- 2. Comment:** A specific determination should be made regarding compliance with the standards and the costs of increased salt loadings on downstream users. (39).
- Response:** Federal and state statutes control the water quality standards to protect existing beneficial uses. Therefore, there are legal constraints to impairing water quality, and compliance with state standards presumes no injury to beneficial users. Quantified damages in the Lower Colorado River Basin states attributable to salinity are estimated to average \$513,300

(November 1982 price) annually for each milligram per liter increase at Imperial Dam (Bureau of Reclamation 1983). The increase of salinity of 1.6 milligrams per liter for the CCSOP and 4.8 milligrams per liter for the GCC joint venture represent damages of \$1,123,200 and \$3,369,600, respectively.

- 3. Comment:** Mitigating measures and augmentation plans regarding surface and ground water are required in the FEIS to protect senior downstream users. (13, 19, 50).
- Response:** Mitigation measures and augmentation of senior water rights will be developed through water court proceedings and negotiations with injured water users. These topics are not within the scope of the EIS, except as already addressed in general sense.
- 4. Comment:** A complete worst case analysis is needed concerning the impacts resulting from maximum CCSOP water withdrawals from Colorado River. (11).
- Response:** The concept of worst case analysis is not included in the FEIS because it does not reflect the realistic hydrologic impact of actual project operation. A yield analysis of water withdrawal from Colorado River is presented in Section 4.1.1.2 of the FEIS. The analysis includes the CCSOP water withdrawal for each month during low flow period under maximum withdrawal condition.
- 5. Comment:** Page 4-47 states that "Potential surface runoff and soil erosion from the spent shale pile may pollute the reservoir water (Big Salt Wash) and stream flows . . . The Munger Canyon disposal site . . . may interrupt stream flow and degrade water quality in Munger Creek". What will be done to prevent these impacts? (42).
- Response:** Mitigation measures are presented in Section 4.18 and Appendix C-1 of the FEIS.
- 6. Comment:** It is stated on page 4-38 that all process and plant wastewater will be sent through a water treatment system before being released to a sediment reservoir on Clear Creek. A description of the treatment and reservoir system in terms of meeting zero discharge requirements is needed, particularly in the case of potential salt loading. (10).
- Response:** Description of the wastewater treatment for process and plant wastewater is discussed in Section 2.3.2.3 of the DEIS. Water from the treatment system will be returned to the spent shale conditioning instead to the sediment reservoir as noted in revised Section 4.4.1.2 of the FEIS.
- 7. Comment:** An assessment of potential salt loading due to spent shale disposal should be provided. (10).
- Response:** The sedimentation reservoir located downstream of the spent shale disposal site is designed as a zero discharge system to intercept any potential leachate or runoff from disturbed areas. It is not expected to cause any salt loading into the downstream Clear Creek system from the spent shale disposal area.
- 8. Comment:** The statement "Water withdrawals from surface streams could deplete streamflow of the Colorado River . . ." on page 4-35 should be changed to ". . . would deplete streamflow . . .". (10).
- Response:** Concur. See revised Section 4.4.1.2.
- 9. Comment:** A discussion is needed on cumulative project effects on salinity. (12).
- Response:** Salinity impacts on Colorado River due to water depletion have been predicted by the Colorado River Basin Salinity Control Forum (CRBSF 1981). Detailed information can be obtained from the report "Water Quality Standards for Salinity Colorado River System", as prepared by the Forum.
- 10. Comment:** Detailed cumulative hydrologic analyses are needed to address the cumulative effects of other related energy development projects in the region. (10, 12).

- Response:** Project water requirements data are not available for all the proposed synfuels projects in Colorado. Cumulative environmental impacts due to shale energy development in northwestern Colorado have been evaluated by the Colorado Department of Health (1982) in cooperation with the U.S. EPA. A copy of the report can be obtained from either agency.
- 11. Comment:** Clear Creek needs to be added to the discussion of "Withdrawals of groundwater and depletions to streamflows of Roan Creek" on page 4-36 of the DEIS. (13).
- Response:** Based on pumping test data, groundwater withdrawal from alluvial aquifer did not show any stream flow depletion of Clear Creek upstream of the Tom Creek confluence. The FEIS is revised (See Section 4.4.1.2) to include a discussion of the effects on Clear Creek downstream of Tom Creek confluence.
- 12. Comment:** The sum of the estimated annual net depletions for the three GCC member companies (Getty, Chevron, and Cities Service) should be 73,000 acre-feet/year. The projections for salinity impacts for Chevron and for the sum of the estimated annual withdrawal should be adjusted accordingly for all three companies. (14).
- Response:** Concur. The 73,000 acre-feet/year water withdrawal is an estimated value provided by the Operator. Water requirements for other GCC joint venture partners were not available at the time of DEIS preparation. Also, water requirements could also change during the project development. See revised Section 4.4.1.2.
- 13. Comment:** The paragraph beginning "Spent shale disposal . . ." on page ment: the paragraph beginning "Spent shale disposal . . ." on page 4-35 should note that all reservoirs tend to attenuate peak runoff events by storage and controlled releases. (14, 15).
- Response:** Concur. See revised Section 4.4.1.2.
- 14. Comment:** Clarify the second paragraph on page 4-42. Is this analysis additive $24,000 + 72,000 = 96,000$ or a total of 72,000 acre-feet? (15).
- Response:** The analysis is based on a total of 72,000 acre-feet year for the GCC joint-venture partners.
- 15. Comment:** A statement should be added in the FEIS to explain why the CCSOP water storage capacity would be required. (15).
- Response:** Concur. The DEIS has stated that during low flow, water may not be available for diversion from the Colorado River. It is obvious that an adequate storage capacity would be required to fully meet the CCSOP's needs.
- 16. Comment:** It should be noted that under the federal safety of dams program, the Colorado State Engineers Office will require specific construction and operational requirements to ensure dam safety and integrity. (14, 15, 16).
- Response:** The dam safety program is in place but does not guarantee the safety of any structure. The DEIS simply points out the probability of dam failure based on historical data, and the consequences in an unlikely event of dam failure.
- 17. Comment:** The first paragraph, third sentence on page 4-35, should read: "Water storage reservoirs may pose potential hazards to downstream communities in the unlikely event of failure". (14, 15).
- Response:** Concur. See revised section 4.4.1.2.
- 18. Comment:** On page 4-166, first paragraph, the figure 25,000 acre-feet is incorrect; it should read 24,000 acre-feet. (15).
- Response:** Concur. See revised Section 4.14.

- 19. Comment:** On page 2-71, it should be noted that flood hazard is not a function of dam height, but rather volume of water impounded. (14, 15).
- Response:** Flood hazard is a function of dam height and volume of water impounded. In addition, flood hazard could also be a function of geologic settings, hydrologic conditions, and many other factors.
- 20. Comment:** Flood hazard is not only a function of dam height but also a function of other factors. Therefore, the flood analysis on page 4-43 should be modified. (16).
- Response:** The flood analysis on page 4-43 has considered dam height and volume of water impounded.
- 21. Comment:** Clarify the impacts resulting from water withdrawals, especially during the low flow period. (16).
- Response:** The FEIS is revised to delete the words "especially during low flow periods". See revised Section 4.4.1.2.
- 22. Comment:** Clarify in the FEIS the concept of zero discharge from spent shale pile. (16).
- Response:** The zero discharge system only applies to the Clear Creek mesa spent shale disposal site. Leachates and surface runoff from the spent shale pile will be retained in the downstream sedimentation reservoir. There will be no discharge to the Clear Creek drainage system. Potential water quality impacts from leachates and surface runoff in the Big Salt Wash spent shale disposal area still exist. The FEIS is revised to delete the discussion of impacts on Clear Creek.
- 23. Comment:** Clarify the statement that withdrawals of ground water from alluvial aquifer could deplete stream flows of Roan Creek. (16).
- Response:** The DEIS merely indicates the potential for stream flow depletion of Roan Creek due to withdrawals from alluvial aquifers. Information available does not rule out the possibility of stream flow depletion of Roan Creek and Clear Creek downstream of Tom Creek confluence, under conditions of long-term pumping of the alluvial well system.
- 24. Comment:** On page 4-36, it should be noted that surface runoff at the surface mine will be collected and used for dust control, not discharged. The surface runoff management plan (Moore 1982d), should be more thoroughly explained in the FEIS. (16).
- Response:** The DEIS has stated that sedimentation reservoir is designed as a zero discharge system and the stored water would be used for dust control (refer to Section 4.4.1.2).
- 25. Comment:** The FEIS should clarify quality of surface runoff from the mine site and disturbed areas. Discussion should include constituents present in the soils and other geological materials in the vicinity. For example, Table 2.3-6 contains information regarding the constituents present in processed shale. (16).
- Response:** The DEIS stated it is difficult to predict the quality of the surface water runoff from the disturbed area. Constituents present in the soils and other geological materials do not provide any definite prediction of water quality changes due to the complexity of geochemical process. Surface runoff from retorted shale disposal area may have higher concentrations of TDS, TOC, fluoride, and sodium based on other available studies as presented in the Spent Shale Disposal subsection of Section 4.4.1.2.
- 26. Comment:** With regards to the Upper Dry Fork Reservoir discussion on page 4-43, a "worst case" dam breach is extremely unlikely, and the narrative in the FEIS should clarify this likelihood in lay terms to be more meaningful to the public. (16).

- Response:** The DEIS has already stated that the probability of the dam failure is small. The probability is about 10^{-4} failures per dam year, which means the probability of dam failure within any one year would be 0.01 percent.
- 27. Comment:** The FEIS should clarify the wastewater treatment discussion on page 4-38 of the DEIS. The retaining of all effluent from the treatment plant should be explained. In the second to the last sentence of page 4-38 the statement "only possible impact" should be clarified in the FEIS. (16).
- Response:** A detailed discussion of water treatment for all effluent is presented in Section 2.3.2.3 of the DEIS. Effluent water from treatment plant will be returned to spent shale conditioning instead to the sediment reservoir. The FEIS is revised accordingly (see Section 4.4.1.2).
- 28. Comment:** On Figures 4.4-1 and 4.4-2, (1) Lower Conn Creek dam site is incorrectly sited; (2) according to the footnote these springs and seeps were identified during helicopter flights, however the baseline (Chevron 1982h) indicated ground level confirmation; (3) the identification numbers in this table do not correspond to the numbers in Figure 4.4-1. (16).
- Response:** (1) Figure 4.4-1 is revised to reflect the comments. (2) Table 4.4-1 stated that the majority of springs and seeps were identified during helicopter flights. Only a few of springs were ground-confirmed during the field reconnaissance trip for the baseline study. (3) Table 4.4-1 presents only those springs and seeps that will be affected by mining. Figure 4.4-1 presents all the springs and seeps in the vicinity of project site.
- 29. Comment:** Under the Clear Creek Mesa subsection on page 4-44, second paragraph, clarify in the FEIS how "significant" will the impacts be for the 100-year, 24-hour event. (16).
- Response:** The word "significant", as used in the DEIS, is a qualitative term and cannot be quantified. The FEIS is revised to indicate the cumulative impacts due to the releases from the two reservoirs.
- 30. Comment:** The FEIS should clarify the discussion of the Clear Creek sedimentation reservoir, indicating that surface runoff and seepage flowing through the mine area "would be routed through the reservoir to allow for settlement". This statement sounds as if water will be released from the reservoir after settling. The relationship of this statement to the earlier characterization of this reservoir as a zero discharge facility needs to be clarified in the FEIS. (16).
- Response:** Concur. See revised Section 4.4.1.2.
- 31. Comment:** Under the Upper Dry Fork Reservoir subsection on page 4-40, the third sentence should read: "The reservoir *could* be built under a plan of staged construction". (15, 16).
- Response:** Concur. See revised Section 4.4.1.2.
- 32. Comment:** Under the Upper Dry Fork Reservoir subsection on page 4-41, the following sentence should be inserted in the FEIS after the word "diverted". "While these figures represent a worse case withdrawal scenario, the net river depletion estimates shown on page 2-2 of Attachment GC-3 more accurately reflect the Chevron depletions." (16).
- Response:** Concur. The FEIS is revised to include a discussion of stream flow depletion due to the Operator's withdrawal only. The worse case analysis is deleted. (See revised Section 4.4.1.2).
- 33. Comment:** Clarify the cumulative impacts on water consumption and BLM jurisdiction resulting from water withdrawals from Colorado River. (16).
- Response:** It is true that the impacts due to water withdrawals will occur eventually regardless of who uses the water. However, the EIS must describe the obvious impacts for cumulative project development. BLM does not have nor does intend to be involved in the jurisdiction over water allocation. See revised Section 4.14.

- 34. Comment:** Clarify the cumulative impacts on present and future water users resulting from water withdrawals from the Colorado River. (16).
- Response:** Concur; see revised Section 4.14.
- 35. Comment:** Clarify in the FEIS any significant water quality impacts different from those discussed for the Proposed Action including what would happen with wastewater from the Fruita upgrading operation. (16).
- Response:** Wastewater from the Fruita upgrading operation will be treated through the wastewater treatment plant. The effluent will then be piped to the Clear Creek mesa plant site through the water pipeline, which diverts the water from Colorado River for project water supply. The FEIS is revised to clarify the wastewater treatment operation. (See Section 4.4.1.2).
- 36. Comment:** Table 3-4-4 indicates that several parameters were "not detected." Because detection limits can vary substantially, it would be more complete to either list the detection limits used, or at least state the general basis for the detection limits used (e.g., EPA Standard Methods). This should be corrected in the FEIS. (16).
- Response:** The detection limits for all the parameters are presented in Appendix E of the Surface Water Hydrology and Water Quality Baseline Report (Chevron 1982h). This level of detail is not necessary for the EIS.
- 37. Comment:** The last sentence on page 3-15 should be clarified in the FEIS to reflect existing data indicating that portions of Clear Creek normally flow only during spring runoff. (16).
- Response:** The DEIS stated (page 3-15, fifth paragraph) that in the absence of storm runoff, most of the stream channels are dry during the summer months.
- 38. Comment:** The discussion of Clear Creek stream flow on page 3-15 appears to be based upon 1-year's flow measurement. The discussion in the FEIS should acknowledge that significant year-to-year fluctuation in stream flows is possible. (16).
- Response:** Stream flow data for Clear Creek presented in DEIS is based on flow records from July 1980 to June 1981. The DEIS has stated that discharge for streams in the CCSOP study area varies with respect to location and time.
- 39. Comment:** The statement that salt loads contributed by municipal and industrial use are of minor significance should have a further explanation or citation. (16).
- Response:** The statement is based on the information presented in the FEIS for the Colony Project (BLM 1975).
- 40. Comment:** Under the Water Use, subsection on page 3-12, the statement regarding projected water consumption by the year 1990 should include an explanation of the basis for this projection or it should reference CRBSCF (1981). (16).
- Response:** The projected water consumption by the year 1990 is based on the reference CRBSCF (1981).
- 41. Comment:** Under the Water Use subsection on page 3-12, the statement "Stream flows have been substantially altered" should be clarified with reference to present/past impoundment periods. (14, 15, 16).
- Response:** Since the majority of stream diversion occurred during high flows, stream flows are altered in two ways: (1) reduced average annual flow, and (2) changes in the pattern of stream flow seasonal variations, especially during high flow period.

- 42. Comment:** The water quality discussion in Section 3.4.1 should provide detailed information on federal and Colorado water quality control measures. (16).
- Response:** The DEIS has referenced the Colorado River Basin Salinity Control Forum report, CRBSCF (1981). Detailed salinity control measures can be obtained from the CRBSCF (1981) report. Also, the Department of the Interior report (USDI 1982) has complete information on salinity control program and project status.
- 43. Comment:** The FEIS should clarify the zero-discharge concept as it relates to the sedimentation reservoir on page 4-36. (16).
- Response:** The sedimentation reservoir will be designed as a zero-discharge system to store runoff less than the 100-year 24-hour storm events. Process waters will be treated in a wastewater treatment system prior to its use for spent shale conditioning. No process waters will be stored in the sediment reservoir. For any flood events higher than the design flow (10-year 24-hour storm event) the release of reservoir water could release sediment into Clear Creek.
- 44. Comment:** The discussion of wastewater generated at the plant site should be clarified in the FEIS. Explain the type of water treatment that wastewater will receive. Explain the basis for the treatment that "water quality impacts on streams would be minimal" (page 4-38). The likelihood of any discharge and the nature of any discharge should be addressed. (16).
- Response:** Description of wastewater treatment is presented in Section 2.3.2.3 of the DEIS. The wastewater treatment plant effluent will be used for spent shale conditioning and no wastewater will be released into the surface water system. The possibility of accidental spillage and potential impacts should be greatly reduced provided that appropriate spill prevention and mitigation plan can be implemented.
- 45. Comment:** Prior to the last sentence of the last paragraph on page 4-40, insert in the FEIS the following: "The first stage storage capacity of this reservoir could be reduced somewhat if water from the Ruedi Reservoir is made available to the CCSOP in order to supplement junior water rights when they are not in priority to divert." (16).
- Response:** Concur. See revised Section 4.4.1.2.
- 46. Comment:** The last sentence on page 4-44 refers to "the stream". Which stream is this? (17).
- Response:** The sentence is changed to read "the alluvial aquifer appears to be in direct communication with Clear Creek below Tom Creek (Chevron 1982h)". See revised Section 4.4.1.2.
- 47. Comment:** The DEIS on page 4-42, third paragraph, indicates that the channel below the Roan Creek dam site could be degraded due to the increased erosivity of the stream flow. If uncontrolled, this could result in a deeply incised, steep walled channel of reduced value to wildlife. What measures does the Operator propose to control head-cutting degradation? (18).
- Response:** Channel degradation on Roan Creek downstream of the dam site due to the increased erosivity of the stream flow will be very minor. Also, the Operator will take every possible measure to prevent channel erosion and degradation for purposes of dam safety.
- 48. Comment:** We realize water rights junior to the GCC reservoir system may be called out to fulfill project demands. What would the impact be on other water users in the basin if this call should occur? (19).
- Response:** In the case of a call, water users' junior to the GCC water rights upstream of Colorado River will not be able to fulfill their water rights based on the Colorado Water Right law. The actual effects on agricultural and other water use upstream cannot be precisely predicted because of lack of data.

- 49. Comment:** What will be the impact on agriculture if significant agricultural water rights are converted to mining purposes? (19).
- Response:** Some of the agricultural land may be converted to other type of land uses such as industrial, residential, and commercial uses. Secondary impacts of this conversion are a major state and federal land use policy issue and have been the subject of studies by the Colorado Department of Agriculture. They are beyond the scope of detailed discussion in this EIS, however.
- 50. Comment:** What is the planned annual water consumption by the CCSOP. (20).
- Response:** The average annual water use would be 24,000 acre-feet for CCSOP and 73,000 acre-feet for GCC.
- 51. Comment:** What is the salinity concentration in the Colorado River at De Beque? (20).
- Response:** The average instream TDS of Colorado River at De Beque is about 418 milligrams per liter.
- 52. Comment:** Water usage of over 600 gallons per capita per day in Grand Junction does not appear to be reasonable. (20).
- Response:** Water uses in Grand Junction include industrial customers which usually far exceed the suggested range of 68 to 199 gallons per capita per day for domestic use; thus, the per capita average figure is above the average domestic figure.
- 53. Comment:** The updated information on water consumption and salt loading in Colorado River should be referenced. (20).
- Response:** The BLM (1975) report was mentioned in two instances on page 3-2 of the DEIS. First, the water consumption for Colorado would be 2,949,750 acre-feet instead of 2,976,000 acre-feet. Second, approximately 47 percent (instead of 60 percent) of the salt load comes from natural sources (Bureau of Reclamation Salinity Update; BOR 1983).
- 54. Comment:** Reference should be cited for the 1990 Upper Colorado River Basin consumption. (20).
- Response:** The 1990 Upper Colorado River Basin consumption values are based on the Colorado River Basin Salinity Control Forum Report (CRBSCF 1981).
- 55. Comment:** The first sentence on page 4-166 is redundant. The last sentence in the first paragraph needs to explain how the present and future uses would be affected. (20).
- Response:** The first sentence reiterates the stream flow impacts due to water withdrawal. Water users will be affected in terms of increased salinity level in stream water, and reduced water resources for future development projects.
- 56. Comment:** The FEIS should address the amount of water which will be required for urban and commercial growth associated with the proposed project and how this will affect irrigated agriculture in the area. (30).
- Response:** The amount of water required for urban and commercial growth associated with the proposed project is estimated to be 2,800 acre-feet/year based on (1) the population increase of 25,000 during operation (refer to Section 4.12.3.2 of the DEIS), and (2) water consumption of 100 gallons per capita per day. Assuming a worst case that CCSOP would meet the water demand by purchasing of agricultural water rights and that 1.9 acre-feet of water per year is consumed by every acre of irrigated land, approximately 1,476 acres of irrigated land may be converted to other land usages.
- 57. Comment:** The FEIS should include discussions of adverse and positive impacts in relation to the dam failure probabilities and natural flood mitigation, respectively. (35).

- Response:** The probabilities of dam failure have been discussed in Section 4.4.1.2, Upper Dry Fork Reservoir subsection. The positive impacts of natural flood prevention are dependent on the available remaining storage capacity in the reservoir during the flood events. Since the objective of the Roan Creek reservoir is CCSOP water supply, it is doubtful that the reservoir will provide any mitigation of natural flood hazards.
- 58. Comment:** The long-term impacts on the salinity and of call issues of the Colorado River Basin Compact should also be evaluated. (36).
- Response:** Long-term salinity impacts on the Colorado River due to CCSOP water withdrawal would be minor. Based on the projected water uses of 24,000 acre-feet/year for CCSOP, salinity of the Colorado River at the Imperial Dam in the year 2010 would increase by 1.6 milligrams per liter.
- Long-term impacts on compact call issues is beyond the scope of the EIS and will be regulated and controlled by Colorado water rights laws and various federal laws.
- 59. Comment:** Detailed impact analysis due to spent shale leachates should be provided. (38).
- Response:** The DEIS has presented qualitative discussion of the water quality characteristics of leachate, based on the available U.S. Army Corps of Engineers studies and as stated in Spent Shale Disposal subsection of Section 4.4.1.2.
- 60. Comment:** What is the significance of the projected increase in salinity in the Colorado River resulting from project construction? (38).
- Response:** Salinity impacts on Colorado River due to project construction would be minor and temporary. Mitigation measures presented in Section 4.18 and Appendix C-1 should alleviate the impacts.
- 61. Comment:** Page 4-41 states that "Approximately 10 percent of the mean annual flow (of the Colorado River near De Beque) could be diverted." What impacts will that have on senior water users downstream? (42).
- Response:** The 10 percent of stream flow depletion is a worst case condition as explained in the DEIS. Impacts on senior water users are controlled by state law. Junior water uses are required to augment and fulfill downstream senior water users' needs if they desire use of the water while out of priority.
- 62. Comment:** Page 4-46 states that "Appropriate design of an on-site drainage collection system and spill prevention plan should alleviate the potential impacts". Again, we would like to see descriptions of the on-site drainage collection system and spill prevention plan. (42).
- Response:** Detailed on-site drainage collection system and spill prevention plan will be developed during the permit application stage if the Fruita I project configuration is developed.
- 63. Comment:** Detailed dam design and geology data should be provided. (42).
- Response:** Adequate information is available on dam design and geologic conditions of the reservoir site to assess potential impacts.
- 64. Comment:** Page 4-42 states that "... salinity of the Colorado River at the Imperial Dam in the year 2010 would have increased by approximately 17.23 milligrams per liter ... salinity would increase by 1.6 milligrams per liter and 4.8 milligrams per liter respectively". Would these increases create any problems and how severe might they be? Can anything be done to mitigate salinity increases? (4, 42).
- Response:** The Department of Interior and Department of Agriculture are undertaking various salinity control projects in the Colorado River Basin to mitigate the salinity impact due to the salt

contribution from existing sources and expected future Basin water uses, including industrial water use such as CCSOP and GCC water withdrawal. These agencies, and their recent reports, should be consulted for detailed answers to these questions.

- 65. Comment:** Page 4-40 states that "An accidental spill is a possible impact of the syncrude pipeline . . .". What will be done to prevent spills, and in the event of a spill, what procedures would be used? (42).

Response: The Operator will have to develop a spill contingency plan prior to construction and operation of the pipeline.

- 66. Comment:** Page 4-36 states that "The impacts on the drainage basin, water quality, and water quantity would be minimal provided that an appropriate runoff diversion scheme around the disturbed area is planned". What is the appropriate runoff diversion scheme? (42).

Response: The runoff diversion scheme for the underground mine will be the same concept as the surface runoff management plan for surface mine as stated in the DEIS.

- 67. Comment:** How will runoff, which collects on the benches of the retorted shale disposal site, be handled? (44).

Response: Prior to the revegetation, runoff from the benches will be pumped back to the retorted shale disposal site. After the establishment of vegetation, runoff from the disposal site will be greatly reduced and should not pose any surface water impacts.

- 68. Comment:** The use of alternative water sources (including saline water) for compaction of process shale should be addressed in the FEIS. (10, 44).

Response: Utilization of saline water for spent shale conditioning could change the rate of leachate chemical-reaction or cause geotechnical instability. In addition, it is economically infeasible to have a dual water system to handle both saline water and raw river water.

- 69. Comment:** Clarify the worst case surface water flow and salinity analysis in Section 4.4.1.2. (10, 18, 35).

Response: The worst-case analysis does not reflect the realistic hydrologic impact of actual project operation. The FEIS is revised to delete the worst-case analysis. See revised Section 4.4.1.2.

- 70. Comment:** Page 4-166 states that "[t]he cumulative impacts on water quantity and quality due to water withdrawals by this and other projects from the Colorado River would affect present and future water users", but it does not explain *how* water users would be affected. (38).

Response: The water users would be affected in terms of increased salinity levels and stream flow depletion in the Colorado River. Actual effects cannot be reliably predicted and quantified for purposes of this EIS.

- 71. Comment:** Impacts on water uses should be explained. (39).

Response: Impacts on senior water rights are controlled by state law. Junior water uses are required to augment downstream senior water users if utilizing the water while out of priority.

- 72. Comment:** What is the estimated salinity level (and water quality standard) at downstream points? (39).

Response: The salinity criteria of Colorado River at Imperial Dam is 879 milligrams per liter. The estimated 1983 salinity level is 821 milligrams per liter based on the data presented by Colorado River Basin Salinity Control Forum.

- 73. Comment:** Inadequate detail is given on the effects of the Operator's use of surface and ground water in the Clear Creek well field and Clear Creek itself. These effects should be discussed as they regard the other users of surface water rights, primarily from Dry Fork upstream to the heads of Kimball Creek, Roan Creek, Carr Creek, and Brush Creek. (6).

- Response:** The effects of the Operator's surface and ground water use to other surface water users include depletion of stream flow in Clear Creek and Roan Creek downstream from Clear Creek confluence. No impacts are expected on water users of Kimball Creek, Carr Creek and Brush Creek.
- 74. Comment:** Discuss the effects that the 33 wells in Clear Creek valley will have on the downstream water users. (6).
- Response:** Pumping from ground water wells may deplete aquifer storage and stream flows. Detailed augmentation plans will be developed through water court proceedings and negotiations with injured water right or users.
- 75. Comment:** Mitigation measures need to be identified for water quality and quantity effects of pumping from the Clear Creek well field. (7).
- Response:** Detailed mitigation measures for water quality and water quantity have been addressed in Appendix C-1 of the DEIS. Impacts due to the Clear Creek well field include depletion of aquifer storage and potential stream flow reduction.
- 76. Comment:** To state on page 2-53 that the construction phase will have the highest adverse impacts on surface waters (concerning sediment loading) is arguable, when impacts on senior downstream water rights are considered. (13).
- Response:** The impact discussion presented in that section is for the purpose of comparison of alternatives as discussed in Sections 2.4.1 and 2.4.2 of the DEIS. The impacts of flow reduction on downstream users are the same for each alternative having the same production rate. The impact due to construction activities is the major controlling factor in comparison of alternatives.
- 77. Comment:** The reference to the Upper Dry Fork site on page 4-47 should be noted as the proposed site, not an alternative. (14, 15).
- Response:** Concur. See revised Section 4.4.1.2.
- 78. Comment:** The paragraphs on page 2-69 concerning effects of surface water withdrawals on downstream water users should be expanded to address the Colorado Water rights doctrine. (16, 35).
- Response:** Concur.
- 79. Comment:** On page 3-12, it is *Lee* Ferry, Arizona, not *Lees* Ferry. The allocated share for Colorado consumption should be 2,499,750 acre-feet, not 2,976,000 acre-feet. (14, 15, 16).
- Response:** Concur. *Lees* Ferry should be changed to *Lee* Ferry. The allocated share for Colorado consumption should be 2,949,750 acre-feet (instead of 2,499,750) based on the comments from Colorado Water Conservation Board.
- 80. Comment:** A number of minor corrections and clarifications are needed in Section 3.4. (14, 15, 16).
- Response:** Concur.
- 81. Comment:** The water rights narrative on page 2-29 should include a yield analysis of the project rights. (20).
- Response:** Due to a significant annual variability in the amount of water physically and legally available for diversion by the four sub-systems of the CCSOP water system, the overall system will be operated somewhat differently each year. In general, the annual operating plans will be predicated on minimizing pumping costs, providing a continuous supply for all components of the project, maximizing raw water yields, and maintaining water supply reservoirs as full as possible.

There are a number of issues affecting the future availability of water to the CCSOP and other Colorado River basin appropriators which must be resolved before a truly accurate estimate of available supplies can be made. Among these issues are Colorado's delivery requirements to the lower basin states under the 1922 Colorado River Compact, Colorado's delivery requirements to Mexico under the 1945 Mexican Treaty, and various minimum river flow criteria established for environmental protection purposes. It may be years before these issues are resolved.

82. Comment: Does the Operator propose to mitigate for increased salinity in the Colorado River as a result of project development and associated costs to others? (18).

Response: Potential salinity increases in the Colorado River as a result of project development are addressed in Section 4.14 of the FEIS.

5.3.5.2 Ground Water

1. Comments: The impact comparison summary for ground water on page 2-53 requires clarification as to why the FII-50 alternative has the highest impact. (16).

Response: The PA-50, CC-50, FI-50, and FII-50 alternatives would result in low adverse impacts due to the smaller scale of these projects and the absence of the open pit mine. The differences in level of overall impact between these configurations is insignificant.

2. Comment: Column headings for Table 3.4-5 are mislabeled. (16).

Response: Concur. The second column should be headed CC-ALL-8, not CC-ALL-4.

3. Comment: The adequacy of the spent shale cover and liner design should be more thoroughly discussed in the EIS. (10, 11, 44).

Response: Concur. See revised Section 4.4.2.2.

4. Comment: What affects on recharge to the alluvial aquifer and water quality in Clear Creek will result from diversion of runoff through underground mine workings? (18, 42).

Response: The water diverted through the underground workings will be collected in a storage reservoir that will be part of the project water supply system. Any discharges from this reservoir to Clear Creek will meet applicable discharge standards.

Diversion of the stream will reduce the amount of water recharging the alluvium of Clear Creek. Data collected during the baseline period suggest that about 217 acre-feet/year was recharged between surface water monitoring stations (CI-13 and CI-14). The diversion would decrease the amount of recharge by this amount. No significant impact will result since senior water rights will be protected under a court approved plan of augmentation.

5. Comment: What will be the impacts to streamflow due to operation of the mesa well field system? (13).

Response: The pumping of the 8 bedrock wells on the mesa may ultimately result in spring flow depletion of a maximum of 200 acre-feet/year. No impact to senior water rights will result since these rights will be protected by implementation of a court approved plan of augmentation.

6. Comment: Clarify in the FEIS whether Piceance Basin ground water formations extend beneath the Clear Creek project site. (16).

Response: Geologic units in which ground water occurs in the Piceance Basin are not present in the areas affected in the Grand Valley alternatives. Several of the proposed corridors do traverse into upper Parachute Creek areas; however, no adverse ground water impacts are expected for these areas.

- 7. Comment:** What impacts will there be on users of springs in the area and how does the Operator propose to mitigate the impacts? (19).
- Response:** No unmitigated impacts will result for senior adjudicated water rights as a result of the project. The final court approved plan of augmentation will assure protection of senior water rights.
- 8. Comment:** Subsidence caused by disposal of spent shale on the mesa may allow leachate to enter the bedrock aquifer system. (27).
- Response:** The Uinta Formation is topographically above the Clear Creek alluvium at the proposed Mesa Valley Fill site. Localized subsidence is not anticipated to be a problem based on rock mechanic evaluations presented by the Operator, which suggest gradual lowering of the land surface above the underground workings will be less than 6-12 inches.
- 9. Comment:** Waste disposal in the mined-out open pit will occur within the Uinta Formation and Lower Parachute Creek member of the Green River Formation. Together these strata make up the significant bedrock aquifer in the area. (27).
- Response:** These aquifers will be removed by the surface mining operation and replaced by a backfill underdrain system to minimize contact of ground water with spent shale. The shale disposal incorporates design features to minimize potential for generation of contaminated leachate.
- 10. Comment:** The majority of the stream loss of Clear Creek may occur as a recharge to the canyon, not on the mesa. The diversion of flow through the mine workings should not affect alluvial channel storage, as stated in the DEIS unless the bypass and sedimentation reservoirs are lined. (13).
- Response:** Data are not available to identify specific areas where the existing recharge may be localized. It is likely that the Bypass and Sedimentation reservoirs will have limited capacity to recharge the alluvial system due to settling of fine materials with low permeability. There is a potential for water quality impact from the use of the underground mine as a diversion, as identified on page 4-45 of the DEIS. The facility will be designed for zero discharge, thus water not meeting the appropriate discharge standards will not be released.
- 11. Comment:** The Clear Creek alluvium may also be a significant local aquifer with a saturated thickness of from 48 to 72 feet. It is unclear how much of this alluvium is to be removed at the Mesa Valley Fill site. (27).
- Response:** No excavation of aquifer material is planned for the Mesa Valley Fill site, other than topsoil salvage operations.
- 12. Comment:** The time period over which alluvial supply sells may be used should be clarified. (13).
- Response:** The alluvial well field may be used for the entire duration of the project to supplement the Colorado River supply system.
- 13. Comment:** On Figure 3.4-4, monitor well CC-U should be shown with CC(A,B). (16).
- Response:** Concur. Figure 3.4-4 has been corrected to reflect this.
- 14. Comment:** Do any unpermitted wells exist near the project area, and if so, what will be the impact of the project on these wells? (19).
- Response:** It is anticipated that if any unpermitted wells do exist, they would be in the alluvial deposits of Roan Creek or Clear Creek, and thus be subject to the same potential impacts as permitted wells in the same area. Any unpermitted wells with senior adjudicated water rights will be protected by a court approved augmentation plan.

- 15. Comment:** What will be the resultant change in runoff characteristics and in the ground water hydrology of the project area after mining is completed? (19).
- Response:** After completion of reclamation, surface runoff characteristics will be similar to existing conditions. The ground water hydrology after reclamation is described in Section 4.4.2.2 (Mining Activities). More detailed information on hydrologic aspects of reclamation will be presented in mined land reclamation permit applications.
- 16. Comment:** The Clear Creek alluvial aquifer is a product of runoff and ground water seepage from topographically higher bedrock. The alluvial aquifer is a source of recharge from the Uinta Formation underlying it. (27).
- Response:** As outlined in Chapter 3.4.2.2, the area of proposed spent shale disposal in the Clear Creek alluvium is in an area where the Uinta Formation is minimally saturated or unsaturated. The steep topographic relief in the project area has caused development of ground water flow systems that discharge from bedrock into the valleys under the driving force of a potentiometric surface that is a subdued reflection of surface topography. Additionally, in the proposed spent shale disposal area, the alluvium is not in contact with the Uinta Formation.
- 17. Comment:** There is no site-specific information in the DEIS for the off-site disposal facilities proposed in scenario 3. (27).
- Response:** Adequate information was available to assess impacts and compose alternatives.
- 18. Comment:** The discussion on ground water hydrology is found to be of academic interest but not of a site-specific nature. (13).
- Response:** Significant site-specific information is presented at a level of detail sufficient for the EIS. More detailed discussions are available in the Operator's environmental baseline reports cited in the text.
- 19. Comment:** The DEIS acknowledges that solution via geochemical interaction would result in higher TDS concentrations. This impact should be quantified for total dissolved solids and also for individual ions and the impact on the receiving ground and surface water system quantified. Opportunities to mitigate adverse water quality impacts should be discussed in the FEIS. (44).
- Response:** It has generally been noted in the literature that increasing the surface area of rock materials will increase the rate of dissolution and chemical weathering. Reclaimed oil shale mines presently do not exist, thus water quality data for backfill material are not available. It is expected that the water quality type will be similar to existing conditions, with all parameters increasing in concentration.
- 20. Comment:** More quantitative information is necessary in the discussion on mining activities to address the actual impacts and potential mitigation opportunities. The EIS should specify, (1) the total rate of the dewatering operation, (2) the specific water quality characteristics of the water derived from dewatering, (3) the fate of the dewatering discharge (i.e., discharge to surface, total containment, use for process water, dust control, etc.). (44).
- Response:** Estimates of mine inflows are presented in the revised Section 4.4.2. The water quality will be similar to that found for baseline conditions in the A groove. Dewatering effluents will be discharged to the network of on site reservoirs and will be utilized in the overall project water supply. No direct discharge of dewatering effluent is anticipated. More specific information on dewatering will be supplied as part of the mined land reclamation permit application.
- 21. Comment:** EPA leaching tests (as well as tests by others) indicate that alternate cycles of saturation and draining produce leachates that do not have a sharp drop in dissolved salts. (44).

Response: The results of site-specific testing of spent shale indicate similar characteristics as are reported in the literature (Chappele 1980). It is true that alternating wet-dry cycles will increase TDS in the first pore volume (Chappele 1980); however, this condition will exist only in the upper portion of the disposal cell, if at all. All available data suggests that TDS will decrease as the amount of leaching continues.

22. Comment: Drawdowns in the alluvium are underestimated in the DEIS. (13).

Response: This comment has been addressed in revisions to Sections 4.4.2.2 and 4.14.4.

23. Comment: The degree of interconnection of the Clear Creek alluvial aquifer and Clear Creek should be more thoroughly discussed in the FEIS. The effects of collecting runoff from the Clear Creek watershed and pumping from the Clear Creek alluvium on downstream senior water rights should be addressed. The affects of any reduction in flow on the salinity of the Colorado river system should be addressed. (13, 14, 16, 17, 42).

Response: The concerns expressed by a number of comments have been addressed in revisions to Section 4.4.2.2, and a summary is presented here. The surface flow in Clear Creek is the primary source of recharge to the alluvial aquifer of Clear Creek canyon. In the area of proposed pumpage from the Clear Creek well field, the zone of saturation is below the bottom of the stream channel, suggesting that a zone of continuous saturation between the stream and the water table is absent. It is likely that channel permeability limits the quantity of water recharging the aquifer, and that an additional drop in the water table will not induce additional infiltration from the stream channel in those areas where the water table is already below the channel. Extensive hydrologic testing by the applicant in the study area indicated that no additional infiltration from the adjacent stream channel was induced during a seven 7-day pumping test. Water produced from the well field will be by interception of underflow moving through the alluvial aquifer.

The proposed water supply development from collection of runoff and the alluvial well field will tend to diminish the quantity of underflow moving through the alluvium. This decrease in quantity of water moving through the alluvium will ultimately be reflected as a depletion of alluvial spring discharges in the lower portion of Clear Creek. In this area below Tom Gulch, a number of alluvial springs occur where the water table intersects the channel bottom. No significant impact to senior water rights will occur since a court approved plan of augmentation will be implemented that protects these senior rights.

The potential reduction in flow from the Roan Creek system may cause a slight reduction in salt loading in the Colorado River system since the outflow from the Roan Creek Drainage is currently more saline than the flow in the Colorado. The effects of the total water system development on Colorado River salinity are addressed in Section 4.4.1.

24. Comment: Clarify the statements regarding ground water conditions of the Uinta Formation. A and B sandstones have been incorrectly described in the DEIS. (13).

Response: Concur.

25. Comment: The reference to Table 4.4-3 on page 4-52, should refer to Table 4.4-2.

Response: Concur.

5.3.6 Topography, Geology, Paleontology

1. Comment: Investigations show that geologic variability occurs between reservoir sites, including differing alluvial thicknesses. Also, no discussion is provided for the Parachute Creek reservoir site. (14, 15, 16).

- Response:** Concur. Although sites are generally similar from a geologic perspective, some differences in the lithology of alluvial deposits and bedrock strata do occur. Alluvial deposits are thickest at the Conn Creek reservoir site.
- Data are limited for the Parachute Creek site (restricted to topographic maps and generally somewhat dated information from Colony reports).
- 2. Comment:** Discussion of failures of the spent shale pile on page 4-74 should be more extensive, including evaluation of water quality impacts and prediction of time frames associated with subsidence. (11).
- Response:** The "failure" discussed on page 4-74 should not be viewed as a single event, but rather as a gradual denudation over time. A catastrophic failure is not anticipated. Water quality impacts may occur and are discussed in spent shale comments and responses. Precise predictions of time periods associated with subsidence cannot be made; as noted on page 4-60, subsidence of 1 foot over a 10 year period is projected.
- 3. Comment:** A sentence should be inserted on page 2-54, Geology, offering justification of the Lower Dry Fork reservoir over Upper Dry Fork. We believe the data supports Upper Dry Fork site as more geologically sound. (16).
- Response:** There is no reference to specific reservoir sites on page 2-54. The only reference to geologic data for reservoir sites is found on page 2-71, and no discussion of specific sites occurs.
- We do, however, concur with this comment in general. Recently received data on geotechnical investigations (Stone and Webster 1982) indicate the Upper Dry Fork as more "geologically sound". Please refer to Table 2.4-8 of the DEIS where the Upper Dry Fork is rated slightly less adverse impacts than the Lower Dry Fork site for topography and geology.
- 4. Comment:** Reservoir inundation will "prohibit" or "prevent" extraction of geologic resources rather than "permanently restrict" their utilization. (14).
- Response:** The word restrict most accurately depicts the anticipated conditions. It is unlikely that all potential resources will be used, and temporal fluctuations in reservoir level may allow for selected borrowing over the life of the reservoir.
- 5. Comment:** An example of the consumptive use of geologic resources (page 2-54) is the use of sand, gravel, and earthen materials in dam embankment construction. (14, 15, 16).
- Response:** Concur. Text has been changed accordingly.
- 6. Comment:** Where will construction gravel be obtained and what is the annual CCSOP gravel requirements? (42).
- Response:** Local gravel operations under existing permits will be utilized wherever economically possible. Specific project gravel requirements are not known at this time.
- 7. Comment:** How will cut and fill slopes be constructed and stabilized so as to minimize short- and long-term slide potential? (42).
- Response:** All cut and fill slopes will be designed and constructed in accordance with sound engineering practices, as specified in construction requirements of state of Colorado and Garfield County highway departments. Such construction will minimize the potential for short- or long-term topographic impacts.
- 8. Comment:** What engineering techniques will be used to protect the stability of the dam from the faults mapped within the west abutment? (42).
- Response:** These two small faults are distinguished from others described by Kirkham and Rodgers (1978) as active. The faults mentioned in the DEIS are not believed to be active. Regardless,

all components of the dam construction will be designed to the stringent specifications of the U.S. Army Corps of Engineers and Colorado permit compliance regulations.

9. Comment: On page 4-62, General Impacts subsection, fourth paragraph: Getty supports this statement. (15).

Response: Concur. Comment is acknowledged.

10. Comment: Why is the 1981 TRW report for the U.S. Naval Oil Shale Reserves used as a paleontologic reference for the CCSOP? (14, 15).

Response: Discussion in the TRW report encompasses potential paleontological resources of the Green River formation in a regional perspective, including the CCSOP site.

11. Comment: The fossil locations noted in paragraphs 4 and 5 on page 4-65 should be identified. (14, 15, 16).

Response: The fossil locality discussion should be referenced to McReynolds (1982). Its exact location is not given so as to preclude unauthorized collecting activities. The text has been changed accordingly to reflect this.

12. Comment: Total reservoir embankment height is 225 feet, instead of 210 feet as indicated on page 4-61. (14, 15, 16).

Response: Concur.

13. Comment: Why can't predictions of cumulative impacts to paleontological resources (per page 4-167) be made? (38).

Response: See revised Section 4.14.

14. Comment: More discussion should be given in the EIS on the impacts of sand and gravel used for project construction on endangered species and riparian habitats. (18).

Response: Specific sand and gravel deposits for project materials have not been identified by the Operator, since operation plans call for use of existing commercial pits. These pits (on private land) fall under the regulatory authority of local governments. Further, not all sand and gravel pits in this vicinity are on the Colorado River.

5.3.7 Soils

1. Comment: Would there be any long-term impacts (i.e., acid rain) to the soil resource or water bodies on the upland plateau resulting from deposition of combustor off-gases? (42).

Response: The absence of acid sensitive soils (i.e., soils with a low pH, base saturation, and cation exchange capacity), and the low sulfate and nitrate deposition values suggest that long-term acidification of the soil resource is improbable. Page 4-9, paragraph 3 of the DEIS, addresses potential impacts to water bodies on the upland plateau.

2. Comment: Table 4.6-1 of the DEIS indicates the reservoir alternatives will not cover any prime farmland. Is this consistent with page 3-66, paragraphs 2 and 3? (14).

Response: Yes, the Table on page 4-67 is consistent with page 3-66, paragraphs 2 and 3.

5.3.8 Aquatic Ecology

- 1. Comment:** A more detailed analysis of impacts to threatened and endangered fishes is needed. (49).
- Response:** See revised Section 4.7, subsections entitled Threatened and Endangered Species.
- 2. Comment:** What additional information are you anticipating and how would it affect your analysis of impacts to aquatic ecology? (49).
- Response:** This statement in the DEIS is incorrect. No additional information has been incorporated in the FEIS that affects projected impacts. See revised Section 4.7.
- 3. Comment:** Would the Roan Creek reservoir support a fishery and would it be built on public land and therefore be available for public use? (10, 18).
- Response:** The Roan Creek Reservoir could support a fishery. The reservoir sites are primarily on private land, and GCC has indicated that public access would not be provided. Also see revised Section 4.18 where the fishery potential is discussed as mitigation.
- 4. Comment:** Table 4.7-2 does not accurately portray water use; please clarify the differences between water rights and water use. (10, 35).
- Response:** See revised Section 4.7 where water use and water rights are more fully explained.
- 5. Comment:** Flow recommendations for maintenance of endangered fish are not always met at present. (10, 14, 15, 16, 42).
- Response:** See revised Section 4.7 for revised flow levels for endangered fish based on information from the U.S. Fish and Wildlife Service.
- 6. Comment:** Stream flows will be reduced due to alluvial pumping and water storage reservoirs. (13).
- Response:** Concur.
- 7a. Comment:** Section 4.7 should be rewritten with available information. (14, 15, 16).
- Response:** Concur. See revised Section 4.7.
- 7b. Comment:** All necessary baseline studies have been provided for the BLM to prepare the EIS. No supplemental data are needed for the FEIS. (16).
- Response:** Concur.
- 8. Comment:** On page 4-70, the paragraph beginning "The water supply system" should be clarified as to probability of significant intake impacts. (14, 15, 16).
- Response:** See revised Section 4.7.
- 9. Comment:** The 3rd Paragraph, on page 4-70 is speculative and should be deleted as it does not accurately assess domestic water requirements that were included in the estimates of Table 2.3-9(A). (14, 15).
- Response:** See response to comment Number 1 of Section 5.3.3, Project Description subsection.
- 10. Comment:** On page 4.7-1, under Section 4.7.2 Reservoirs, insert underlined phrase to read "A maximum size 175,000 acre-ft . . .". (14).
- Response:** See revised Section 4.7.

- 11. Comment:** No trout populations would be impacted by the Conn Creek reservoir sites. (14, 15, 16).
- Response:** The Upper and Lower Conn Creek reservoir sites would inundate portions of Roan Creek where trout have been collected by baseline studies (Chevron 1981x, Chevron 1982a). See revised Section 3.7 for a more detailed discussion.
- 12. Comment:** Flows in Table 4.7-2 reflect recent diversions and text should be revised. (14).
- Response:** A different set of flow data has been used in revised Section 4.7, which takes into account recent proposed diversions.
- 13. Comment:** The effects of water withdrawal should be analyzed in 3 scenarios; total GCC water rights, GCC's water requirements, and CCSOP's water requirements and use. (14, 16).
- Response:** See revised Section 4.7.
- 14. Comment:** The following table should follow Table 4.7-2 to better reflect water depletions by the GCC. (14, 15).

Table 4.7-2A GCC-JV MONTHLY NET DEPLETIONS IN ACRE FEET

Months	GOC	Cities	Chevron at De Beque	Chevron at Loma	GCC-JV Total
January	1,963	2,217	1,052	281	5,323
February	1,773	2,001	962	275	4,736
March	1,963	2,217	1,112	388	5,292
April	2,127	2,123	1,142	493	5,392
May	2,455	2,170	1,172	495	5,797
June	2,743	2,063	1,293	761	6,099
July	3,079	2,110	1,384	870	6,573
August	2,840	2,135	1,094	763	6,074
September	2,349	2,099	1,141	654	5,629
October	2,136	2,201	1,382	495	5,719
November	1,899	2,145	1,052	332	5,096
December	1,963	2,217	1,082	334	5,262
Annual Total	27,330	25,698	13,873	6,410	66,901

^a GCC-JV total depletion is the sum of columns GOC, Cities, and Chevron at De Beque.

Note: Values in table are as provided by Cities Service Company and the GCC Joint Venture.

- Response:** See revised Section 4.7.
- 15. Comment:** Conclusions regarding withdrawal impacts are not supported by the reference on page 4-73, paragraph 4. (14).
- Response:** The reference as cited was used in support of the riverine environmental characteristics not the impact of the weir. See revised Section 4.7.
- 16. Comment:** Concerns for impacts related to the De Beque intake structure are overstated, especially in regards to references to endangered fish? (14, 15).
- Response:** See revised Sections 3.7 and 4.7.

17. **Comment:** GCC has never supported zero return flow. (14, 15).
- Response:** See Chevron (1982w) reference where no return flows from Roan Creek Reservoir are indicated.
18. **Comment:** Add *maximum* after legally in footnotes to Table 4.7-2. (14, 15).
- Response:** Legally divertable and maximum divertable are synonyms.
19. **Comment:** A modified intake design at De Beque is not feasible. (14, 15).
- Response:** See revised Section 4.18 where alternative intake designs are discussed.
20. **Comment:** The 2nd paragraph on page 2-55 needs clarification. (14).
- Response:** Concur. See revised Section 4.7.
21. **Comment:** On page 2-69 under Surface Water subsection, the paragraph beginning "Surface water impacts . . ." is misleading since threatened and endangered fish are not found near De Beque. Page 2-70, Aquatic Ecology, needs a complete rewrite. (14, 15, 16).
- Response:** This section relates to surface water impacts not aquatic biology. Also, aquatic biology includes impacts to species other than T & E species. See revised Sections 3.7 and 4.7.
22. **Comment:** On page 3-41, the paragraph beginning "The Colorado River . . ." should be revised to clarify native versus introduced fishes. (14, 16).
- Response:** See revised Section 3.7.
23. **Comment:** On page 3-41, the paragraph beginning "Physical habitat . . ." needs revision regarding effects of water quality on native fishes. (14, 15, 16).
- Response:** See revised Section 3.7.
24. **Comment:** Presence of cutthroat trout in Carr Creek should be noted in Table 3.7-1. (14, 15, 16).
- Response:** See revised Section 3.7.
25. **Comment:** Note on Table 3.7-2 that Historic and Present Status columns are reversed. (14, 15, 16, 18).
- Response:** See revised Section 3.7.
26. **Comment:** The assumption on page 4-167, second sentence, is not supported. (14).
- Response:** See revised Sections 4.7 and 4.14.7.
27. **Comment:** Page 4-174 should be revised in accordance with revised Section 4.7. (14, 15).
- Response:** See revised Section 4.18, Aquatic Ecology.
28. **Comment:** See attached report titled "Assessment of the Impacts of the GCC Diversion - Intake System on the Aquatic Environment of the Colorado River". (15, 16).
- Response:** This report was taken into consideration in the revision of aquatic ecology sections (3.7, 4.7, 4.14).

29. **Comment:** On page 2-70, Aquatic Ecology:
1. The Goodyear Model is too simplistic.
 2. No evidence of threatened or endangered fish in De Beque area.
 3. Are fishes' swimming abilities impaired in winter?
 4. Can fish escape from a 2 foot/second velocity?
 5. Water withdrawal rates will vary due to water rights with a maximum of 32 percent.
 6. Lower flow periods are critical.
- Response:**
1. Concur, see revised Section 4.7.
 2. See revised Section 4.7.
 3. Fish swimming speed is correlated with water temperature since they are cold-blooded animals.
 4. See revised Section 4.7.
 5. See revised Section 4.7.
 6. Other flow periods are also critical; see revised Section 4.7.
30. **Comment:** On page 3-41, seventh paragraph, first citation is incorrect. (15, 16).
- Response:** Concur. See revised Section 3.7.
31. **Comment:** On table 3.7-1, West Parachute Creek should not show endangered or threatened fishes. (15, 16).
- Response:** See revised Section 3.7.
32. **Comment:** On page 4-69, second paragraph, change dependence to dependent. (15).
- Response:** It is "dependent" in the DEIS.
33. **Comment:** On page 4-70, 5th paragraph, the analysis should be made to river mile-3. (15).
- Response:** See revised Section 4.7.
34. **Comment:** On page 4-71, second paragraph, Roan Creek reservoir should improve downstream water quality. (15, 42).
- Response:** See revised Section 4.7.
35. **Comment:** On page 4-71, third paragraph, delete 15 cubic feet per second and add: "at a rate to satisfy". (15).
- Response:** See revised Section 4.7.
36. **Comment:** On page 4-75, second paragraph, delete second sentence. The remainder of the paragraph does not support this statement. (15).
- Response:** See revised Section 4.7.
37. **Comment:** On page 4-73, second paragraph, delete last sentence; the analysis does not support these percentages. (15).
- Response:** See revised Section 4.7.
38. **Comment:** On page 4-73, fifth paragraph, note that the Chevron (1983a) reference is incorrect. (15).
- Response:** See revised Section 4.7.

39. **Comment:** On page 4-73, the razorback sucker is listed as endangered by the State of Colorado and not listed by the USFWS. (15).
- Response:** The DEIS concurs with your observation on page 3-41.
40. **Comment:** The second sentence on page 4-167 assumes a negative operation of the GCC diversion. (15).
- Response:** Concur. See revised Section 4.7.
41. **Comment:** Line 17 on page 2-55, should indicate that water demands are less at 50,000-bpd versus 100,00-bpd. (16).
- Response:** See revised Section 4.7.
42. **Comment:** On page 2-55, lines 19-33, effects of depletions on threatened and endangered fish should be clarified. (16).
- Response:** See revised Section 4.7.
43. **Comment:** On page 2-70, only impacts of water depletion by the CCSOP should be analyzed in the EIS. (16).
- Response:** See revised Section 4.7 where CCSOP and GCC water withdrawals are analyzed separately.
44. **Comment:** On page 2-70, the CCSOP will cause depletion of 1 percent on an average annual basis and 2 percent on a maximum monthly basis, if average depletion figures are used. (16).
- Response:** See revised Section 4.7.
45. **Comment:** On page 2-81, lines 6-7, impacts to aquatic ecology are more dependent on streams crossed than pipeline length. (16).
- Response:** See revised Section 4.7.
46. **Comment:** On page 2-81, line 11, how are you defining "fish population"? (16).
- Response:** See revised Section 4.7.
47. **Comment:** On page 4-69, there is an incorrect citation for the Endangered Species Act. It is PL 93-205 (16 USC 1531 et seq.) as amended. (16).
- Response:** Concur.
48. **Comment:** On pages 4-69 and 4-70, the threatened and endangered fish should be discussed separately. (16).
- Response:** See revised Section 4.7.
49. **Comment:** On page 4-71, line 17, GCC plans to release water from the reservoir to meet downstream water rights. (16).
- Response:** See revised Section 4.7.
50. **Comment:** On page 4-72, under Water Supply subsection, indicate that the Operator will also use mesa surface water. (16).
- Response:** Concur. See revised Section 4.7.

- 51. Comment:** On page 4-72, line 11, the phrase "and diverting from the Clear Creek headwaters" should be added to the end of the sentence. (16).
- Response:** See revised Section 4-7.
- 52. Comment:** On page 4-72, strike the last sentence of the last paragraph and insert, in lieu thereof, the following: "Water diverted at the Finley Ranch Pumping Plant will be piped directly to irrigation ditches or to other replacement locations as required by Colorado Water Law to protect affected senior user(s). (11, 16).
- Response:** See revised Section 4.7.
- 53. Comment:** On page 4-73, under Water Supply, the FEIS should provide clarification of the following points:
- At the end of the first paragraph add the following: "The U.S. Bureau of Reclamation Supplemental EIS will address in detail the impacts expected to be attributable to Ruedi water sales from the Ruedi Reservoir to the point of diversion from the Colorado River. Impacts from the diversion point are addressed in this document; the proposed or alternative Colorado River diversions and water delivery mechanisms described herein could be utilized". (16).
- Response:** See Response to Comment Number 2, Section 5.3.3, under Project Description.
- 54. Comment:** The first sentence on page 4-74, should be clarified to reflect potential impacts of the Loma Diversion. (16).
- Response:** See revised Section 4.7.
- 55. Comment:** Page 4-76 indicates that no data are available to describe the aquatic resources of the alternative Loma intake sites. Attachment GC-3 provides this data. (16).
- Response:** Attachment GC-3 does not contain data on the Loma intake structure alternative sites. See revised Section 4.7.
- 56. Comment:** On page 4-77, under Water Supply, the last sentence is meaningless and should be deleted. (16).
- Response:** See revised Section 4.7.
- 57. Comment:** The Aquatic Ecology section, on page 4-174, should be revised to include mitigation measures identified in general comments. (16).
- Response:** No aquatic ecology mitigation measures were identified in your general comments or in Attachments GC-5 or GC-6.
- 58. Comment:** On page 2-32, third paragraph, what kind of measures will be taken to reduce or eliminate fish impingement or entrainment when water is withdrawn through the inlet channel of the Loma intake during low flows? (18).
- Response:** See revised Section 4.7.
- 59. Comment:** On page 2-32, 3rd paragraph, are larval threatened or endangered fishes likely to be affected during low flow diversions through the channel at the Loma intake? (18).
- Response:** See revised Section 4.7.
- 60. Comment:** On page 2-55, under Aquatic Ecology, both intake structures must be designed to eliminate entrainment and impingement of aquatic organisms. A study of larval fishes at De Beque is suggested. (18, 42).

- Response:** See revised Sections 4.7 and 4.18.
- 61. Comment:** On page 3-41, paragraph 4, adult Colorado squawfish are captured routinely as far upstream as Palisade, and in 1982 spawning was confirmed in the reach between Palisade and the confluence of the Gunnison River by the presence of larval squawfish. (18).
- Response:** See revised Section 3.7.
- 62. Comment:** On page 4-71, last full paragraph, water quality below Roan Creek reservoir could be improved by multi-level outlets and minimum flows. (18).
- Response:** Only releases sufficient to meet downstream water rights are planned from the reservoir and water quality is expected to be good.
- 63. Comment:** On page 4-73, paragraph 5, the importance of the De Beque area to the razorback sucker, a Colorado endangered species and a candidate for federal listing, is unknown. (18).
- Response:** See revised Sections 3.7 and 4.7.
- 64. Comment:** On page 4-76, under Water Supply, would the design for a Loma intake be the same regardless of the final selected intake site? (18).
- Response:** Yes. See revised Section 4.7.
- 65. Comment:** On page 4-71, impacts in Roan Creek below the proposed reservoir should be expanded. (25).
- Response:** The present aquatic ecosystem in lower Roan Creek is limited to a few taxa of invertebrate capable of living in intermittent streams and the presence of fish on a seasonal basis; its loss was not considered a significant impact. See revised Section 4.7.
- 66. Comment:** On page 4-69, results of the Biological Assessment should be included in the Final EIS. (35).
- Response:** Results of the revised aquatic ecology impact assessment presented in this FEIS will be included in the biological assessment being prepared by BLM.
- 67. Comment:** On pages 4-69 to 4-77, the aquatic ecology impact analysis is inadequate, especially for endangered species. (38).
- Response:** See revised Section 4.7.
- 68. Comment:** On page 4-71, why are no minimum stream flows proposed below Roan Creek reservoir? (42).
- Response:** No water flows in lower Roan Creek during late summer and fall at present, severely limiting the ability of an aquatic ecosystem to exist. The GCC operations do not plan to alter this situation. See revised Sections 4.7.

5.3.9 Terrestrial Ecology

- 1. Comment:** The reference for Chevron (1982m) cited on page 3-56 regarding federally listed threatened plant species does not include all species discussed within the paragraph; therefore Chevron (1981g) should be included for completeness. (14, 15, 16).
- Response:** Concur.
- 2. Comment:** An explanation needs to be added to the discussion on page 4-78 regarding what type of "productivity" is being discussed relative to revegetation. (16).
- Response:** Concur. See revised Section 4.8.

3. **Comment:** The source, basis, and significance of the references to species "of high federal interest" should be explained in the FEIS. (16).
- Response:** The phrase "of high federal interest" pertains not to plant species, but to certain migratory bird species. Several lists of "Migratory Birds of High Federal Interest" have been developed jointly by the U.S. Fish and Wildlife Service and Bureau of Land Management for use in applying Unsuitability Criterion 14 to federal coal leases. Migratory birds meeting any of the following criteria may be designated a species of high federal interest: (1) national importance, (2) regional decline, (3) regional jeopardy, (4) long-term impact, (5) high public value, and (6) indicator species (USFWS 1980).
4. **Comment:** The FEIS should clarify the nature and adequacy of the data base used for analysis of impacts to threatened and endangered plant species. (16).
- Response:** Results of the FEIS are consistent with the terrestrial biological assessment. The DEIS statement that "only the Roan Creek reservoir sites, Roan Creek corridor, and portions of the Clear Creek mesa were searched" for threatened and endangered plants is an accurate reflection of Operator baseline investigation reports (Chevron 1981g,h; 1982a,b,m). Not all of the overall project area has been searched for threatened and endangered plant species. BLM will require that such searches be conducted prior to construction (see Appendix C-1). In this manner, the EIS addresses likely and foreseeable impacts to plant populations which are not presently known.
5. **Comment:** A statement regarding analyses to be performed in preparation of a Biological Assessment should be eliminated from the FEIS. (16).
- Response:** Concur. Results of the final terrestrial biological assessment (prepared independently of the FEIS) are consistent with impact analyses in the EIS.
6. **Comment:** The FEIS should clarify the relationship of preconstruction surveys for threatened and endangered plants to the impact analysis. (16).
- Response:** The statement that "for all pipeline routes, right of way specifications would require threatened or endangered plant surveys" is deemed appropriate for impact analysis because it explains how likely impacts will be avoided. BLM considers it likely that the subject plant populations may currently exist in the pipeline corridors since these corridors have not been intensively searched.
7. **Comment:** Clarify the status of searches for plant species of Special Concern for the sites discussed on pages 4-93 and 4-94 of the DEIS. (16).
- Response:** Discussion on pages 4-93 and 4-94 are based on regional data from agency sources. BLM is unaware of any searches for threatened or endangered plant species in these areas. See Response 4 of this section.
8. **Comment:** The FEIS should clarify the basis for statements regarding impacts to wetlands on page 4-92. (16).
- Response:** See revised Section 4.8.
9. **Comment:** Discuss further the potential loss of a large population of the Uinta Basin hookless cactus (*Sclerocactus glaucus*) as a result of construction of the Upper Dry Fork reservoir, as suggested on page 4-83. (15).
- Response:** The referenced statement is intended to indicate that the cactus population, which is located in the area of the proposed dam face, *would* be lost. Specifically, the population of plants would be destroyed during construction of the dam face (unless transplanted beforehand).
10. **Comment:** The FEIS should reflect on page 2-73 that reservoir impacts to vegetation will be a function of reservoir size. (14).

- Response:** Concur.
- 11. Comment:** Delete or modify the statements regarding cumulative impacts to threatened and endangered plants in the second paragraph on page 4-168. (15).
- Response:** The paragraph should read "Cumulative impacts to threatened and endangered plant species may be significant, particularly in the lower Roan Creek drainage where expansion of housing and infrastructure; and construction of roads, railroads, pipelines, a reservoir, and transmission lines may affect candidate and listed threatened and endangered plant populations. The CCSOP and other oil shale projects within the Roan Creek drainage would contribute to potentially significant impacts to these populations. The BLM, in cooperation with the Colorado Natural Heritage Inventory, is attempting to better define the distribution and abundance of candidate and listed plant species in ongoing studies of the lower Roan Creek drainage. The results of these studies would help to identify feasible alignments for location of housing, infrastructure, and project facilities which would avoid significant impacts to these plant populations."
- 12. Comment:** Discuss suggested mitigation as referenced on page 2-56 for the Upper Dry Fork reservoir area. (18).
- Response:** The statement in the referenced paragraph that "mitigation measures undertaken by the Operator could minimize these impacts" is not applicable to the reservoir site as implied in the context of this DEIS paragraph. Destruction of populations of federally protected plant populations will occur if the Upper Dry Fork reservoir is constructed as planned. For pipeline and other right of way alignments, the Operator would avoid impacts to such plant populations to the extent feasible through selection of routes. Compensational mitigation, such as purchase of land supporting rare plant populations and donation of such land to a responsible agency, would address reservoir impact. Compensational mitigation is suggested, but is not committed.
- 13. Comment:** Discuss the alternatives which exist for Fruita II spent shale disposal if T/E plants are found in the four identified spoil areas. (18).
- Response:** No other alternatives have been identified for Fruita II spent shale disposal.
- 14. Comment:** If impacts to T/E plants resulting from access road construction are unavoidable, how can the assessment of impacts on the Roan Creek corridor be considered anything less than extremely high? (18).
- Response:** A population of Uinta Basin hookless cactus (*Sclerocactus glaucus*) would be affected by construction of the Roan Creek access road east of the proposed reservoir. No feasible alternative alignment has been identified. BLM therefore concurs that a "high adverse" impact rating is appropriate for the Roan Creek access road corridor.
- 15. Comment:** The reference to revegetation feasibility on page 4-78 should be clarified in the FEIS. (35).
- Response:** Concur. See revised Section 4.8.
- 16. Comment:** The reference to the Kimball Creek reservoir should be dropped from review in the FEIS. (14, 15).
- Response:** Concur. Kimball Creek is eliminated from FEIS.
- 17. Comment:** Note on page 2-56 that impacts on threatened or endangered plants are the same for all Roan Creek reservoir alternatives. (15).
- Response:** Impacts on threatened and endangered plant species are the same for each major project configuration because each configuration includes the same reservoir (Upper Dry Fork) with which impacts to these species are associated. Impacts on threatened and endangered plant

species are not the same for all Roan Creek reservoir alternatives. See Section 2.4.7 (DEIS) and Section 4.8.4 (FEIS) for a comparative impact analysis of the Roan Creek reservoir sites.

18. **Comment:** USFWS regulatory authority regarding candidate plant species should be clarified in the FEIS. (14, 15).

Response: The USFWS (1980a) has stated an agency policy that consideration should be given to candidate plant species in environmental planning. BLM does not imply that the USFWS has the authority to regulate candidate plant species.

19. **Comment:** An explanation for the statement on page 4-78 regarding low revegetation potential of riparian woodlands should be provided. (35).

Response: We consider that revegetation includes reestablishment of structure and diversity. Revegetation potential in riparian areas is low as a result of the relatively high structural complexity and diversity of riparian vegetation and the tendency of disturbances in riparian areas to become infested with noxious weeds.

20. **Comment:** Discuss how annual vegetation production estimates were calculated as presented in Tables 4.8-1 and 4.8-4. (35).

Response: The calculations of affected annual production include not only utilization factors but adjustments for forage palatability characteristics for each vegetation type. Available forage is weighted by acreage for each project component area. Site-specific and regional data sources were employed in these estimates. Calculations have been checked per standard quality assurance procedures.

21. **Comment:** Wetland impacts should be quantified and mitigation measures for wetlands provided in the FEIS. (41).

Response: See revised Section 4.8 and Appendix C-1 for wetland mitigation.

22. **Comment:** Discuss how agricultural productivity would be affected by the CCSOP. (38).

Response: Agricultural productivity impacts are addressed in revised Section 4.8.

23. **Comment:** Impacts to riparian habitats and aspen should be considered significant for facility siting alternatives. (18).

Response: The riparian areas and aspen stands as habitat are treated in the evaluation of wildlife impacts.

24. **Comment:** Plant species with federal or state status (page 3-52 of the DEIS) should be revised to accurately reflect the best available information. (33).

Response: The Colorado National Heritage Inventory (CNHI) has identified three additional rare plant species which might occur in the project area based upon habitat suitability and distribution data in their files. These species are:

Scientific Name	Status	Common Name
<i>Mentzelia argillosa</i>	CNHI list	None
<i>Physaria</i> n. sp.	CNHI list	Undescribed
<i>Cryptantha elata</i>	Category 2	None

BLM will consider these additional species in planned pre-construction searches for threatened and endangered species in pipeline, access, and transmission corridors.

25. **Comment:** The latest interaction concerning Category 1 and Category 2 plant species should be incorporated in the FEIS. (33).
- Response:** Concur. The DEIS includes consideration of Category 1 and Category 2 plant species. The most current information available from the Colorado Natural Areas Program is included in the FEIS (see revised Section 4.8).
26. **Comment:** The FEIS should note that no threatened and endangered plants are known to occur in the four Grand Valley spent shale disposal sites. (16).
- Response:** Concur.
27. **Comment:** The DEIS does not properly address how the Operator will protect the integrity of candidate and threatened plant species as well as other plant and animal species listed in the EIS. (4).
- Response:** See revised Section 4.8.
28. **Comment:** The relationship between the impact analysis in the DEIS and the USFWS Biological Assessment and Opinion should be clarified in Section 4.8, as should the impact comparisons for T&E species on Tables 2.4-1 and 2.4-8. (16).
- Response:** Concur. See revised Section 4.8.
29. **Comment:** Roan Creek drainage T&E plant populations are addressed in Section 2.4.7. This discussion should clearly distinguish the corridor where only sensitive plants exist from the reservoir sites where a T&E plant is known. (16).
- Response:** The Uinta Basin Hookless Cactus (*Sclerocactus glaucus*) is known from the Roan Creek corridor and from all of the proposed reservoir sites within the Roan Creek drainage. *Sclerocactus glaucus* is listed by the U.S. Fish and Wildlife Service as threatened. Plant species which are candidates for listing under the Endangered Species Act also occur within the Roan Creek corridor.
30. **Comment:** Concerning vegetation types and climatic zones, the Terwilliger et al. (1974) reference should be used instead of Graham (1937). (14, 15, 16).
- Response:** The Graham (1937) reference is cited since it deals more specifically with zonation of vegetation in relationship to altitude.
31. **Comment:** Committed wildlife mitigation in Appendix C-1 is poorly representative of wildlife mitigation needs for a project with such obvious, extensive and intensive wildlife impacts. More appropriate levels of mitigation will be recommended in the Wildlife Coordination Act Report. (18).
- Response:** See revised Appendix C-1.
32. **Comment:** Mitigation for wildlife habitat lost on private lands is inappropriate. (51).
- Response:** BLM policy is that the agency will not require wildlife mitigation on private lands for this project. However, mitigation listed as committed in Appendix C-1 is not limited to BLM lands.
33. **Comment:** The FEIS should explain why revegetation of surface mined lands should be any more temporary than the existence of the undisturbed native vegetation and the basis for the conclusion that a long-term reduction in seasonal big game use and productivity would occur. (35).
- Response:** The characteristics of processed oil shale, as a soil parent material, are inferior to parent materials which currently exist in the area which would be surface mined. Thus, very long-

term revegetation success is questionable in those areas where processed shale would underlay redressed topsoil. This question is the subject of ongoing research. Existing topsoil resources indicate that an increase in primary productivity over existing levels would be feasible. However, the Operator's reclamation plan does not propose restoration of habitat diversity, springs, and streams which (as stated in Paragraph 2, page 4-80 of the DEIS) is considered integral to restoration of wildlife habitat value.

- 34. Comment:** The relationship between the location of the project area and the area considered as the Piceance Basin should be clarified in the FEIS. (16).

Response: Refer to Figures 2.3-1 through 2.3-4 for location of project facilities and Section 3.5.2.1 (Geology) for location and physiographic description of the Piceance Basin.

- 35. Comment:** The effects on area big game populations by simultaneous development of two major access corridors (as may occur in either the Proposed Action or Fruita I alternative) should be addressed. (18).

Response: Impacts to big game resulting from construction of roads in Roan Creek and Big Salt Wash and project related traffic on them were considered in the impact analysis process. The anticipated magnitude of these impacts was mistated in the DEIS; see revised Section 4.8.

- 36. Comment:** On page 2-64, it should be noted that shale disposal at the Mesa Valley Fill site will affect aspen groves that may be utilized by migratory birds of high federal interest. Recent USFWS/CDOW information indicates use of aspen by accipitrine hawks in the immediate vicinity of the Mesa Valley Fill site. The Mesa Valley Fill site will also destroy cliffs in Willow Creek that house several golden eagle nests. Destruction of golden eagle nests is subject to regulations of the Eagle Protection Act, and may or may not be permitted depending upon specific circumstances and conditions at the time of permit application. (18).

Response: The Mesa Valley Fill site is located in the headwaters of Clear Creek and will not affect the cliffs in Willow Creek.

- 37. Comment:** Impacts to Cooper's hawks will occur as a result of destruction or disturbance of aspen, conifer, and riparian woodlands. (18).

Response: Concur. Text has been changed to reflect potential impacts to Cooper's hawks as a result of destruction of forest habitats. See revised Section 4.8.

- 38. Comment:** The Loma B alternative (not Loma C) lies within 0.5 miles of a roost. The Stalmaster reference in Chapter 8 is incomplete. (16).

Response: Concur. See revised Section 4.8.

- 39. Comment:** There is a statement that certain areas have been designated by the Colorado Division of Wildlife as "essential habitat" for the peregrine falcon. It should be noted in the FEIS that under Colorado law there is no formal process for the designation of "essential habitat", and no binding legal significance to such designation. (16).

Response: Under provisions of Title 33, Colorado Revised Statutes, the responsibility for identifying critical and essential habitats for state-listed threatened and endangered species was delegated to the Colorado Division of Wildlife. Where critical or essential habitats for these species lie on private lands, there are no legally binding provisions for preservation or management of these areas.

- 40. Comment:** The extent of critical winter range in the upper Roan Creek valley delineated in the DEIS is not consistent with baseline information. (14, 15).

Response: Portions of the Roan Creek drainage identified as critical elk winter range in Figure 3.8-1 (referenced on page 3-57) are consistent with data presented in CCSOP baseline data reports (Chevron 1981i; Chevron 1982a).

41. **Comment:** Sagebrush shrubland habitat does not support prairie rattlesnakes; the habitat may support the western rattlesnake (*Crotalus viridis*) and the great basin gopher snake (*Pituophis m. deserticola*). (14, 15, 16).
- Response:** Concur. Stebbins (1966) regards the prairie rattlesnake as a subspecies (*Crotalus viridis viridis*) of the western rattlesnake (*Crotalus viridis concolor*), which is the subspecies which occurs in sagebrush shrublands of the project area.
42. **Comment:** The citation presented for Stalmaster and Newman (1978) was not correctly presented in Chapter 8. (14, 15).
- Response:** The correct citation is:
Stalmaster, N.V.; Newman, J.R. 1978. Behavioral responses of wintering bald eagles to human activity. J. Wildl. Manage. 42(3): 506-513.
43. **Comment:** Secondary impacts of the CCSOP on terrestrial wildlife may be greater than the direct impacts of the project. (18).
- Response:** Secondary impacts to wildlife could be regionally significant and of moderate, adverse intensity depending upon the extent, intensity, and effectiveness of mitigation.
44. **Comment:** Information concerning the number and location of golden eagle nests reported in the 1982 baseline addendum for the Clear Creek property should be addressed in the FEIS. (18).
- Response:** Results of baseline raptor surveys conducted during 1982 (Chevron 1982x) were incorporated in the DEIS impact analysis. The discussion presented on page 3-57, Section 3.8.2 of the DEIS, also incorporates these findings, although the 1982 wildlife baseline addendum report (Chevron 1982x) is not referenced.
45. **Comment:** The potential for the occurrence of black-footed ferrets in the region cannot be discounted based on recent sightings nearby, and deserves further assessment. (18).
- Response:** Concur. The Operator has committed to pre-construction searches of corridors to determine the potential for occurrence of black-footed ferrets.
46. **Comment:** Underpasses on roads should be provided for livestock as well as wildlife. (50).
- Response:** Concur. These are recommended mitigation matters (see Appendix C-1).
47. **Comment:** Construction of intakes on the Colorado River at De Beque and Loma could adversely affect nesting bald eagles. (4).
- Response:** According to all information available during preparation of the DEIS, including CDOW and USFWS data, no bald eagle nesting has been documented in the vicinity of the proposed intake location of De Beque or Loma. Construction schedules will avoid activities in these areas during periods of bald eagle occupancy, according to mitigation measures which have received commitment from the Operator (see Appendix C-1).
48. **Comment:** Will not road kills of wildlife increase as a result of the proposed project? (4).
- Response:** Increased road kills of wildlife are anticipated regionally, as stated throughout Section 4.8 of the DEIS.
49. **Comment:** Baseline information concerning big game critical winter range and raptor nest sites is available at a comparable level of detail for the Munger Creek, Stove/Buniger Canyon, and Garvey Canyon shale disposal sites. (16).
- Response:** Concur.

- 50. Comment:** Interpretation of the term "regional population" of the Eagle Protection Act has not yet been defined by final USFWS reclaiming procedures, hence, a conclusion that the CCSOP will not jeopardize the regional population of golden eagles may not be appropriate. (18).
- Response:** Until definition of this terminology is complete, a more definitive statement than that which appears in the DEIS concerning regional impacts to golden eagles cannot be made.
- 51. Comment:** The Colorado River around De Beque is an important bald eagle winter concentration area. (18).
- Response:** As stated in the DEIS, bald eagles are commonly seen during winter in the immediate vicinity of De Beque. Review of Fisher et al. (1981) and other information available to BLM indicates that higher densities of wintering bald eagles occur upstream and downstream of the Roan Creek-Colorado River confluence. At the time the DEIS was prepared, no bald eagle roost sites were known to occur within 0.5 mile of the proposed De Beque intake location, according to CCSOP baseline reports and contacts with the Colorado Division of Wildlife.
- 52. Comment:** Based on available information, it is not appropriate to conclude that impacts resulting from potential displacement of raptors due to the FII-50 alternative would not be detrimental to the regional viability of these species. (18).
- Response:** Our review of existing regional and site-specific information suggests that the raptor species which are most likely to be impacted by the FII-50 alternative are the prairie falcon and golden eagle, both of which nest in high densities in the Book Cliff region. While productivity of these species in the region may be affected through loss of nesting and foraging habitat, both species occur in sufficiently high densities to ensure their continued regional viability.
- 53. Comment:** Habitat for peregrine falcons cannot be considered essential if falcons are not present. (14, 16).
- Response:** Areas identified in the DEIS as essential habitat for the peregrine falcon were delineated by the Colorado Division of Wildlife and are considered essential to maintenance *or recovery* of this species.
- 54. Comment:** For Figure 3.8-1, the source (BLM 1980a) should be referenced in the FEIS. (16).
- Response:** The source of information presented in Figure 3.8-1 appears in Chapter 8.0 of the FEIS as "U.S. Bureau of Land Management (BLM) 1980a".
- 55. Comment:** The statement that additional detail concerning potential impacts of alternative pipeline corridors will be provided in the USFWS Coordination Act Report and Biological Assessment is erroneous since data bases used in these two analyses are the same as that used in preparation of the EIS. (16).
- Response:** Concur.
- 56. Comment:** Quantification of impacts to big game populations is deficient in the DEIS. (38).
- Response:** Estimates of animal losses are not incorporated in the DEIS, since the validity of any conclusions reached using untested assumptions cannot be verified quantitatively. Quantification of big game animals lost as a result of road kill or reduced carrying capacity requires use of numerous interdependent assumptions concerning behavioral responses of affected individuals and populations, none of which can be definitively tested at present.
- 57. Comment:** On pages 4-82 to 4-87 regarding endangered species, because all project area lands were not surveyed for listed plants, the potential existence of T&E plants in non-surveyed areas should be a consideration in the development of right-of-way permit stipulations. Further surveys

should be performed prior to the permitting of any disturbance. CCSOP baseline raptor surveys were not performed with sufficient intensity or at optimum times to provide reliable data on the potential existence of peregrine falcons. In addition, we (USFWS) do not believe that the instability of cliff ledges is legitimate argument against habitation of the Clear Creek area by peregrines. Golden eagles appear to be doing relatively well on Clear Creek area cliffs. The occurrence of golden eagles would more likely be limited by cliff instability than would peregrines which have a documented history of nesting in "inferior" locations. (18).

- Response:** Regarding threatened and endangered plants, the Operator has committed to searches prior to construction (see revised Appendix C-1). The Operator has also agreed to pre-construction searches to identify important raptors and threatened or endangered terrestrial vertebrate use areas (Appendix C-2). Conclusions regarding the suitability of cliff nesting sites for peregrine falcons in areas of project impact were based on those of a widely regarded expert familiar with the area (Craig et al. 1978).
- 58. Comment:** Regarding statements on page 3-53, who selects sensitive wildlife habitats? They have no regulatory status at present. (14, 15, 16).
- Response:** Of the areas identified as sensitive habitats in the DEIS, only raptor nests and critical mule deer and elk habitats presently require special consideration mandated by federal or state statutes. Areas which provide environmental requirements for the maintenance of wildlife populations locally or regionally were designated as "sensitive habitats" in the DEIS. Basis for delineation of these areas were state and federal sources identified in the DEIS.
- 59. Comment:** If potential loss or disturbance to raptor habitats is greater for Fruita alternatives, the Proposed Action and Fruita I alternatives should not have similar levels of adverse impacts. Indeed, the Fruita I alternative may have significantly greater impacts on big game as well. Bald Eagles are listed as endangered in Colorado; however, the southern subspecies is not known to occur in the area. (18).
- Response:** As described in Chapter 2.0 of the DEIS, the Fruita I alternative would not involve any alteration of potential cliff nesting sites for raptors. The Fruita II alternative would involve alteration of such habitat as a result of shale disposal and construction of a shale haulage railroad. The Fruita I alternative and the Proposed Action differ only in incorporation of an upgrading plant (a 400-acre site) in the Fruita I configuration. Since no additional potential cliff nesting habitat would be affected by the Fruita I alternative, and big game densities are lower along the 16 Road corridors relative to those along the Roan Creek corridor, these two alternatives were considered to have impacts of the same order of magnitude (i.e., not significantly different). The Colorado Division of Wildlife (CDOW 1978) lists the southern bald eagle (*Haliaeetus leucocephalus leucocephalus*) as endangered.
- 60. Comment:** The statement concerning the relative losses of critical mule deer winter range and habitat for other species at each of the various reservoir sites is not consistent with the results of the baseline study of the reservoir areas. (14, 15, 16).
- Response:** Concur. See revised Section 4.8.
- 61. Comment:** Although we recognize the difficulty of assessing wildlife impacts over large areas, baseline wildlife inventories conducted by the Operator were not consistently performed on all project area lands. (18).
- Response:** The wildlife baseline inventories were adequate for purposes of the EIS. Additional site specific inventories would be required by the BLM or appropriate agency prior to actual construction on any public lands which have not been studied in detail. On private lands, the Operator has committed to some additional inventories before construction (see Appendix C-1). For areas where data was inconsistent, BLM used the worst-case analysis approach for assessing impacts, as directed by the Council on Environmental Quality in their EIS regulation. (See 40 CFR 1502.22).

- 62. Comment:** Discuss the relationship between the terrestrial and aquatic biological assessments, Fish and Wildlife Coordination Act report, and the terrestrial and aquatic ecology sections of the FEIS. (4).

Response: Since publication of the DEIS, final versions of the terrestrial biological assessment and the FWS Coordination Act report for the CCSOP have been received by BLM. Further, the aquatic ecology impact analysis that will be used in the aquatic biological assessment has been completed (see revised Section 4.7 of the FEIS). Copies of the above background reports are available for review in the BLM Grand Junction office. Portions of the DEIS were misstated in reference to the above documents. The DEIS analysis of these impacts was adequate, and the essential findings did not change from the DEIS to FEIS. Analysis of the FEIS was incorporated into the biological assessments and Coordination Act report (Technical Assistance Report).

5.3.10 Visual Resources

- 1. Comment:** Classification of a hazardous waste site as an adverse visual impact, without specifics as to location or size, is arbitrary. (16).

Response: The form and color contrast introduced by a surface landfill facility is expected to be perceived by the general public as an adverse impact, regardless of size or location.

5.3.11 Cultural Resources

- 1. Comment:** On page 4-168 concerning cultural resources, the paragraph beginning "Cumulative impacts . . ." is not associated with the proposed project. (14).

Response: Disagree. The text is appropriate for cumulative effects to cultural resources from the CCSOP and other projects.

- 2. Comment:** On page 3-62, Clear Creek Mesa and Associated Siting Activities, the first paragraph should note that Centuries Research of Montrose, Colorado conducted cultural resource field surveys of the Dry Fork Reservoir sites for GCC. (14. 16).

Response: Citations have been revised to include GCC. The Centuries Research work is already noted in the text at the above mentioned location.

- 3. Comment:** On page 4-100, concerning cultural resources, in the second paragraph, the discussion of the likely impact of the project on the Canyon Pintado Historic District is confusing. It is unclear from the present text of Section 4.10.1 whether the potential impacts in that region are considered significant. (16).

Response: BLM believes page 4-100 is clear. The reference to see Section 3.10.4 specifically portrays the significance of Canyon Pintado.

- 4. Comment:** The BLM has not begun the consultation process with this office (Colorado Historic Society) to determine the eligibility of the cultural resources located within the impact area of this project, pursuant to 36 CFR 800.4. This should be completed in the earliest stages of planning to insure adequate consideration of the cultural resources. We request a list of the cultural resources, the BLM's determination of eligibility and effect, and a list of the cultural resource survey reports. (31).

Response: BLM has submitted determinations of eligibility. The necessary baseline reports and detailed data can be reviewed in BLM's Grand Junction offices. The Operator has provided copies of all cultural resources baseline reports to the Colorado SHPO.

- 5. Comment:** Prior to any construction that may impact cultural resources, testing for eligibility and mitigation of the adverse effects to eligible resources must be completed. (31).
- Response:** BLM does not require testing to prepare determinations of eligibility. We will have submitted a Form 106 for comments by The Advisory Council on Historic Preservation before any impact to a cultural resource site determined eligible to the National Register of Historic Places.
- 6. Comment:** We agree that all areas where there have been no cultural resource surveys must be surveyed prior to any construction activities taking place to determine if there are eligible sites that may be impacted. (31).
- Response:** Concur. This is standard policy for BLM.

5.3.12 Land Use, Recreation, and Wilderness

- 1. Comment:** Describe indirect agricultural impacts of the CCSOP more fully in the EIS. (10, 49).
- Response:** A population increase of up to 28,000 individuals is predicted in Section 4.12.3.2 of the EIS. Using the Prototype Oil Shale Leasing EIS (BLM 1982k) figure of 0.22 acres affected per individual, approximately 6,160 acres of land could be affected by project-induced growth. The percentage of this total acreage that is cropland is unknown. Assuming the majority of new residents would settle in the Battlement Mesa or Grand Valley urban areas, the major land use impacts would occur in area zoned residential, with little agricultural land absorbed.
- Project development could reduce the amount of water available for irrigation, converting agricultural lands under irrigation to nonirrigated agricultural, residential, industrial, or commercial land. At present the anticipated amount of water loss to industrial uses is unknown. If the land losing its irrigation water becomes residential, commercial, or industrial, the impact would be beneficial as the value of these types of lands is greater than irrigated agricultural land. Conversely, if the land becomes nonirrigated agricultural land, adverse impacts would occur as this type of land is less valuable than irrigated land.
- 2. Comment:** Table 4.11-1 does not make a distinction between various types of agricultural lands (i.e., irrigated, cropland, orchards, etc.). Such a breakdown would provide a more accurate reflection of the land use impacts. (25).
- Response:** Within the project area, the primary agricultural use of land is irrigated cropland and pastures. Data are not available to allow acreage calculations by agricultural use types.
- 3. Comment:** How will corridors and access roads affect accessibility to back-country areas? (36, 45).
- Response:** Access will be controlled, particularly up to Clear Creek mesa. Many of the corridors follow existing rights-of-way. Pipeline corridors and other alternative siting activities would occur on private property and hence access would be controlled.
- An unpredictable increase in the incidence of poaching, trespassing, and off-road vehicle use probably will occur; however, by controlling access through corridors the impact would be minimized.
- 4. Comment:** Discuss the reasons why (1) a reservoir is a beneficial land use, and (2) why the Lower Dry Fork site is better than the others for this one factor. (25, 42).
- Response:** The beneficial land use rating results from the assumption that the reservoirs would remain following project shutdown and be available for alternative uses such as recreation and water supply.

Lower Dry Fork Reservoir received a slightly less adverse rating than the other alternative reservoirs due to its greater accessibility to the De Beque area and due to the greater water surface area available for recreational purposes.

- 5. Comment:** On page 3-69, delete the second to last sentence regarding Special Recreation Management Areas. It is confusing. (15, 16).

Response: Concur.

- 6. Comment:** Describe more fully the project impacts on agricultural land use, including dust mitigation, mitigation of commercial/industrial/mining traffic on farm roads, and mitigation of adverse impacts on normal farming practices. (8, 9).

Response: Dust mitigation measures are described in Air Quality and Meteorology sections of the EIS. Mitigation of commercial/industrial traffic on farm roads will be handled at the local level by Mesa and Garfield County Commissioners. One potential mitigation measure may be to fence a portion of the haul road right-of-way to develop a corridor within the right-of-way for driving livestock to summer and winter ranges. This will be recommended in revised section 4.18, Mitigation.

- 7. Comment:** On page 3-66, last paragraph, note that nearly all of the lands impacted by the proposed reservoir alternatives located in Roan Creek Valley are located on privately owned lands. Also, we disagree with the definition of prime farm lands; Roan Creek Valley properties are meadows and hay pastures, generally used to support livestock grazing and should also be included as prime farm lands. (14, 15, 16).

Response: Concur with the private ownership comment.

Regarding prime farmlands, the U.S. Soil Conservation Service (1979a) definition of prime farmland was used. Meadows and hay pastures, although potentially productive, do not necessarily constitute prime farmland, as they fail to meet important soil moisture criteria of the prime farmland definition.

- 8. Comment:** Table 4.6-1 indicates no prime farmlands occur within the reservoir alternatives. This is inconsistent with siting on page 3-66. (15).

Response: As defined by U.S. Soil Conservation Service (1979a), no prime farmlands occur within alternative reservoir localities.

- 9. Comment:** Table 2.3-10 should show acres of private land to be acquired for right-of-way. (10).

Response: Concur.

- 10. Comment:** Why were the Dinosaur National Monument and Mt. Zirkel Wilderness Area not included in the discussion of wilderness areas on page 3-71? (44).

Response: The study area as defined in Section 3.11.3.1 "extends from Mack eastward to Glenwood Springs, northward to the Flat Tops, and south to the Colorado National Monument . . .". This area was projected to receive the most frequent recreational use by the CCSOP personnel, due to a 2-3 hour driving distance from the project area. Dinosaur National Monument and the Mt. Zirkel Wilderness Area (as well as Arches National Monument) lie outside of the land use, recreation, and wilderness study area and hence were not considered.

- 11. Comment:** At the end of Section 3.11.1.1 on page 3-66, the BLM states that recreation areas do not occur within the project area. However, this statement appears inconsistent with Figure 3.11-1. Either the text or the map should be revised. (16).

Response: Concur. Figure 3.11-1 is correct.

- 12. Comment:** Table 2.4-10, regarding impact comparisons of product transport corridor alternatives, should include consideration of land use impacts. (25).
- Response:** Land use impacts equate with recreation impacts for comparisons made in Table 2.4-10 and are thus covered under "recreation". Other minimal land use impacts could occur (i.e., to grazing), but construction details are unknown at this time; therefore, other land use impact comparisons cannot be made.
- 13. Comment:** This "insignificant" land use change from open space to industrial, as characterized on p. 4-104, would change this area's land uses for over 100 years. Such bold statements are unwarranted. (25).
- Response:** Concur.
- 14. Comment:** On page 4-107, the comparison of wilderness areas to developed playgrounds in communities is irrelevant. (25).
- Response:** Refer to Sections 3.11.2 and 3.11.3, which will allow a better understanding of the regional setting for comparison of impacts.
- 15. Comment:** The land use and resource conflicts between the Operator's proposed Big Salt Wash Reservoir location and the development of the Dorchester Coal lease north of Fruita should be addressed in the FEIS. (40).
- Response:** Concur. See the revised text of the BLM's Preferred Alternative (Section 2.4.11). Additional information was submitted by Dorchester on June 30, 1983 and July 26, 1983 that supplements their May 3, 1983 DEIS comment and is available for public inspection at the Grand Junction BLM office.

5.3.13 Socioeconomics

- 1. Comment:** Cumulative socioeconomic impacts, including the hiring of local workers should be addressed more fully in the EIS. (16, 37).
- Response:** The purpose of the CCSOP EIS is not to undertake an analysis of all potential oil shale projects in operation at the same time. Its purpose is to go about a clearly defined and detailed evaluation of the impacts of the CCSOP in conjunction with the impacts of other likely developments. In that evaluation, cumulative impacts have been taken into account. Local government representatives, BLM, and the Operator arrived at a consensus as to which projects were likely to occur. These included Phase I of the Union Oil Shale Project, the Colorado-Ute power plant in Mesa County, several large coal mines, and the shutdown phase of the Colony Project. When CCSOP impacts were evaluated against the impacts of these projects (including the No Action Alternative) the assessment was cumulative.
- The assumption that certain workers are "local" refers not so much to hiring policies as to worker characteristics. In-migrating workers who do not commute out of the study area on weekends, who in fact become residents, share the same family, income, and housing characteristics as resident workers.
- 2. Comment:** More background information is needed in the FEIS to explain the forecasting models used for employment and population projections. (37).
- Response:** Because population projections are crucial to the socioeconomic analysis, great care went into the method by which they were made. BMML*, in consultation with CDM and BLM, chose to use PAS (Planning and Assessment System) because of its history of extensive use and because its adaptation by the CITF (Cumulative Impacts Task Force) made it particularly suitable for evaluation of energy projects in northwestern Colorado. PAS and its predecessors have been in use for 10 years by numerous federal and state agencies, and

private corporations. This history and the model's applicability to assessment of the socioeconomic impacts of large projects encouraged CITF to adopt it as part of its evaluation process.

CITF also developed the data, including the BAS file (Basic Activity System — a detailed description of the future workforce requirements of basic economic sectors and of potential energy projects), required to do detailed socioeconomic evaluations of project impacts in the six-county area of northwestern Colorado. These factors argued for use of PAS, and the data developed by CITF, to evaluate the population and economic effects of the CCSOP.

The choice of that model was reviewed by, and concurred in, by representatives of local governments and BLM, several of whom were also very much involved with the CITF. The impacts of the CCSOP were analyzed within the context of all other projects in the study area and projected economic growth.

* Briscoe, Maphis, Murray, and Lamont; the firm hired by Chevron as a growth management consultant. BMML, with oversight by BLM and CDM, did the primary socioeconomic analysis of the CCSOP. The results of that analysis were then incorporated in the EIS.

- 3. Comment:** Socioeconomic mitigation measures described in the EIS should be expanded, and should receive financial commitments from the Operator before the project is developed. Specifically, loan guarantees to Grand River Hospital District, road improvements to 16 Road, and a growth management plan for Mesa County should be addressed. (1, 8, 9, 11, 16, 37, 48).

Response: The EIS documents the need for socioeconomic mitigation and includes a description of the Operator's policies on socioeconomic mitigation. In addition, although the Operator does not commit itself to any specific measures, Appendix C-2 in the DEIS (revised and reprinted in the FEIS) includes an extensive list of mitigation practices and procedures they will consider. However, it is not BLM's policy to require committed or guaranteed mitigation of socioeconomic impacts. The extension of the analysis to make possible its use as a growth management plan certainly falls outside the requirements of an EIS. It is anticipated that detailed mitigation plans and procedures and the specific beneficiaries of such mitigation will be identified during the local permitting process.

See revised Section 2.4.11 in the FEIS for BLM's preferred alternative regarding the access to the Fruita plant site, and revised section 4.18 and Appendix C-2 in the FEIS for additional clarification and background information on socioeconomic mitigation matters.

- 4. Comment:** The socioeconomic and environmental implications of a significant change of the level of development, including a delay or abandonment of the project, need to be fully evaluated in the FEIS. (7, 11, 16, 42, 43).

Response: The subsection of Operator's statement on social and economic mitigation measures that discussed mine closure was inadvertently left out of the DEIS. That subsection "Mine Closure", and a new one entitled "Early Project Closure or Delay" are included in the reprint of Operator's mitigation measures in revised Appendix C-2 of the FEIS. These two subsections add clarity to possible mitigation of the adverse impacts of slowdown or premature closure of the project.

- 5. Comment:** The EIS should address the efficiency, convenience, and overall justification for the majority of the workforce and personnel associated with the CCSOP to live in and around the De Beque community. (6)

Response: The question of allocating population to De Beque was carefully considered, discussed by the Operator, BLM, and local government staff (city and county), and eventually discarded as a viable alternative under the No Action scenario. The Battlement Mesa experience of

high front-end costs (public and private), long-term commitments, under-utilized existing investments, and the need to be cautious in the face of slowdowns supported Battlement Mesa as the best alternative for CCSOP under the current circumstances. Existing capacity and diverse economic support is the basis for selecting the Grand Valley (Grand Junction area) and the Battlement Mesa locations as the key places for in-migrating employees to settle.

The costs of mass transportation, personal time lost, efficiency, and effectiveness on the job are valid and were considered in depth. However, the larger social costs associated with creating a new town around De Beque, along with the desire to create a diverse base for each affected community in case slowdowns were to occur, tipped the balance to the solution represented in the DEIS.

- 6. Comment:** The impact analysis in the EIS should assess the economic costs and benefits to farming, farming support industries (e.g., implement dealers), agricultural land values, and the agricultural labor force as a result of project development. (30).

Response: The analysis presented in the DEIS is adequate. Further, any predictions made in such an analysis at present would be very general, since project development plans are not yet final.

- 7. Comment:** The communications between Operator and Battlement Mesa, Inc. concerning mitigation assumptions should be added to the EIS. (16).

Response: Concur. The communication is included at the end of revised Appendix C-2.

- 8. Comment:** A number of minor clarifying sentences and corrections are needed to the various sections of the EIS which discuss socioeconomic baseline conditions, socioeconomic impacts, and those responsible for preparation of those sections. (16, 37).

Response: We generally concur.

- 9. Comment:** Social and economic impacts of the Fruita alternatives to Mesa County, including sharing of tax revenues between Garfield and Mesa Counties, needs to be more fully explored in the EIS. The Fruita alternatives should not have been selected only so Mesa County could reap economic benefits from the project. (42, 49, 50).

Response: The Fruita alternatives were selected by BLM as feasible alternatives to all development on Clear Creek mesa, and were evaluated to the same level and degree as all other alternatives. That evaluation indicated (1) a clear shift in population and revenue base depending on location of project facilities, and (2) little significant difference between the environmental impacts of Fruita I and Proposed Action except for air quality, which would be less severely impacted by Fruita I.

There is no evidence to suggest any possibility of a revenue sharing agreement between Colorado counties unless legislation enabling and requiring such sharing were to be enacted.

- 10. Comment:** Data are available to present findings of worst-case analysis of the socioeconomic impacts at a 50,000-bpd production rate level (Table 2.4-2 of the DEIS). (16).

Response: Data available for evaluation of the socioeconomic effects of the PA-50, CC-50, and FI-50 alternatives are not as extensive as data available for the other alternatives. However, they are sufficient to make valid comparisons between the alternatives and so no worst-case analysis is required.

- 11. Comment:** A social impact assessment (SIA) should not only present a discussion of the types of sociological impacts and social problems which result from rapid growth, but should also analyze the implications of these changes. (37).

Response: The depth of analysis requested, although desirable, would have been possible only upon completion of primary research. Legal constraints generally place such an effort beyond the scope of an EIS. Therefore, the majority of data for the social impacts section was derived from secondary sources. Given that the SIA literature provides very few generalizable analyses documenting the sociological implications of rapid growth related to energy development, the EIS had little information upon which to draw for such a discussion.

5.3.14 Energy and Transportation

5.3.14.1 Energy

- 1. Comment:** Corrections are needed to Table 3.13-1 regarding power generating facilities in project area. (14, 15, 16).

Response: Table 3.13-1 has been revised to reflect updated information (see below).

Table 3.13-1 POWER GENERATING FACILITIES IN PROJECT AREA

Plant	Location	Type of Unit	Generating Capacity ^a
Palisade	Palisade, CO	Hydro	3,000 kW
Shoshone	Near Glenwood Springs, CO	Hydro	14,400 kW
Fruita	Fruita, CO	Natural Gas/Oil	18,650 kW ^b
Lower Molina	Near Colbran, CO	Hydro	4,860 kW ^b
Upper Molina	Near Colbran, CO	Hydro	8,640 kW ^b
Hayden	Hayden, CO	Coal	Two Units: 184,200 kW 261,000 kW
Nucla Station	Nucla, CO	Steam Turbine	36,000 kW ^b
Bullock Station	Montrose, CO	Steam Turbine	12,000 kW ^b
Morrow Point	Near Montrose, CO	Hydro	120,000 kW ^b
Crystal	Near Montrose, CO	Hydro	28,000 kW ^b
Craig	Craig, CO	Coal	800,000 kW ^b
Bonanza	Near Bonanza, UT	Coal	Under construction
Cameo	Cameo, CO	Coal/Natural Gas	66,000 kW

Source: EWD (1981); Wendling (1982).

^a kW = kilowatts (1,000 watts)

^b These units are either peaking or intermediate units

- 2. Comment:** The methodology used in the Net Energy Analysis has not been adequately explained. The use of materials energy and infrastructure energy is inappropriate and the ratios calculated are open to question. The equipment energy should be "amortized" over a 25 year period. (12, 35).

Response: The Energy Analysis Handbook for Oil Shale Development (BLM 1982i) provides a methodology and data for various scenarios of oil shale development. As such, the Handbook is over 260 pages in length, hence rendering detailed discussion of the methodology within the DEIS impractical. The Handbook is available for loan upon request.

The purpose of the net energy analysis is to trace total energy requirements of a project back to the resources in the ground (including materials energy). If the analysis were to count only direct energy (e.g., oil, natural gas, electricity) the results would only partially depict the actual energy costs of the project. By including all energy costs (materials, drilling, transportation, refining of crude oil) a clearer understanding of the actual costs of a project is obtained.

Data used in the calculations have been based on the amount of energy (or materials) per 1,000 tons of oil shale mined. These figures were developed by the Colorado School of Mines Research Institute (CSMRI) and are based on data supplied by various oil shale companies and on publications from the oil shale industry. In developing these figures, a 30-year life was assumed by the CSMRI.

There is disagreement among energy analysts as to whether or not infrastructure energy should be included within the energy costs of a project. The Colorado Office of Energy Conservation (1982) is concerned with energy consumption within the state, hence infrastructure energy was included. The inclusion of infrastructure energy is also included to gain a complete picture of the total energy costs of the project.

Detailed calculation sheets for the net energy analysis are available upon request.

3. Comment: Hydroelectric power should have been considered as an energy source for the project. (7).

Response: Hydroelectric generation was considered by the Operator as part of reservoir development. However, due to water needs of the project, as well as environmental considerations, the reservoir is planned to be a "no-discharge" facility. Hydroelectric generation is therefore, not possible.

5.3.14.2 Transportation

1. Comment: Eliminate the third sentence, last paragraph on page 2-59, regarding differences in levels of transportation impacts. (16).

Response: Disagree. All other impact summary sections make similar statements. Elimination of this sentence would make this section inconsistent.

2. Comment: Impacts due to passage of 450 trucks per day for coal transport up Roan Creek valley must be more detailed and comparisons should be made to alternative rail transport. The rail line should be used instead of trucks to reduce impacts. A common railroad line for all projects in the Roan Creek drainage should be required by the BLM. (4, 18, 50).

Response: The impacts of the 450 trucks per day are addressed throughout the DEIS. Specific locations include pages 4-19, 4-34, and 4-94. More importantly, the 450 trucks per day scenario has been incorporated within the Net Energy Analysis in Table 4.13-2, and within the transportation analyses for all alternatives in Tables 4.13-4, 4.13-6, and 4.13-8. Table 2.4-11 summarizes relative impacts. The alternative to truck transportation (a railroad line up Roan Creek) is described on page 2-39. The impacts of all railroad alternatives are presented for applicable disciplines in Table 2.4-9. Relative impacts of roads versus railroad lines can be seen by comparing Tables 2.4-9 and 2.4-11.

The BLM preferred mode of coal transport up Roan Creek valley is rail (see page 2-86 of the DEIS). The BLM cannot require a shared railroad facility among separate companies. Such a course of action will be encouraged by BLM within the operational constraints of each company.

3. Comment: Do the impacts of worker transportation reflect the predicted population figures for the production rate alternatives? A mass transit system should be required to reduce impacts. (18, 25).

Response: Within the first 9 years, the total number of workers is similar for the 100,000-bpd and 50,000-bpd alternatives. However, during full production years (i.e., year 2000 and beyond) the project employment for the 50,000-bpd alternatives is less than one-half of the 100,000-bpd alternatives. Worker transportation impacts would be reduced by approximately one-half.

BLM cannot require the operator to use mass transportation. This stipulation is more applicable to the jurisdiction of local permitting entities.

4. Comment: More discussion should be given in the EIS on current road conditions, necessary improvements to existing roads, the funding of these improvements, mitigation measures, and impacts of future operations of the CCSOP on roads. (29).

Response: The concerns brought forth by the Colorado Department of Highways are valid. CCSOP will be required to obtain permits from appropriate state and local agencies regulating road improvements, traffic volumes, etc. Mitigation measures are identified in Appendix C-1.

5. Comment: More detailed information on traffic to and from the mine and processing facility and proposed transportation improvements is needed. Traffic should be limited by the BLM to one-lane roads. Better definition of highway segments should be supplied. (8, 9, 16).

Response: Daily traffic figures for affected road segments are shown in Tables 4.13-3 through 4.13-11 of the DEIS. Affected road segments are shown in Figure 3.3-1. During project construction, transportation improvements would occur.

The BLM cannot restrict traffic as suggested. A one-lane road to service such major project facilities would cause serious safety problems.

6. Comment: Clarification is needed between the 90-trucks per day figure on page 4-94 and 450 trucks per day shown on page 2-34. (25).

Response: Concur. This error was corrected on the Errata Sheet issued with the DEIS, item #11. The true value is 450 trucks per day.

5.3.15 Cumulative Impacts

1. Comment: The cumulative impact section does not provide sufficient data or analysis of cumulative impacts. The contributions of each project considered cannot be determined and the criteria used for selection of projects are not reasonable. The criteria for significance of impacts should be given. Figure 4.14-1 should be modified to reflect what is in the text. (10, 18, 25, 35, 36, 44).

Response: See revised Section 4.14.

5.3.16 Mitigation and Reclamation

1. Comment: Is the development of 16 Road necessary and justifiable as an alternative to be considered in the EIS? (18).

Response: Yes. It is a feasible corridor alternative for the Fruita project configurations. BLM considered it necessary to address this alternative in the EIS.

2. Comment: Additional details concerning socioeconomic mitigation should be included in the FEIS as presented in the background socioeconomic reports for the project. (16).

- Response:** In reviewing Section 4.12 (socioeconomic impacts), 4.18 (socioeconomic mitigation), and Appendix C-2 (detailed social and economic mitigation measures) in the DEIS, BLM feels that all pertinent mitigation measures are presented in adequate detail for EIS purposes. The appropriate background reports (and they are extensive) are incorporated by reference in the EIS.
- However, it should be noted that Appendix C-2 is revised and reprinted to include statements by the Operator on mine closure and early project closure or delay.
- 3. Comment:** It is noted on page 4-68 of the DEIS that coal debris, raw shale, or spent shale dust could be deposited on the soils along transportation routes during operation. What measures will be taken to prevent this? (42).
- Response:** Dust suppression methods will be used to prevent these particles of material from becoming airborne. Details of such measures have not been developed at this stage of the project planning. However, prior to development the CCSOP must obtain numerous permits from various federal, state, and local agencies that will control suppression of airborne material. The discussion presented in the EIS is adequate for general impact analysis purposes.
- 4. Comment:** What are the long-term maintenance plans for decommissioning and reclamation of sediment ponds, hazardous waste disposal sites, spent shale drainage and leachate control, and spent shale pile stability? (18).
- Response:** Final plans for some of these features are not fully developed at this early stage of project development. The CCSOP must obtain permits for various agencies approving long-term maintenance plans prior to development. Discussion of such plans is adequate for purposes of the EIS.
- 5. Comment:** In some detail, what are the "safe routing" and "proper control" mitigation measures alluded to throughout Appendix C-1? (42).
- Response:** These measures are sufficiently defined for purposes of the EIS. The CCSOP must obtain permits from the BLM, Corp of Engineers, and MLRB which regulate these matters.
- 6. Comment:** Describe specific project impacts on agricultural land use, including dust mitigation, mitigation of commercial/industrial/mining traffic on farm roads, and mitigation of adverse impacts on normal farming practices. (8, 9).
- Response:** Dust mitigation measures are described in Air Quality and Meteorology sections of the EIS. One potential mitigation measure may be to fence a portion of the haul road right-of-way to develop a corridor within the right-of-way for driving livestock to and from summer and winter ranges.
- 7. Comment:** The DEIS should address the need for upgrading plant communities and the probability of eventually having more than adequate brush regrowth through natural seed left in the top soil. (6, 50).
- Response:** The planned reseeding mixture for CCSOP includes desirable forage species and plant materials which are likely to be successful under anticipated post-mining reclamation conditions. Shrub species are included to enhance the diversity of forage for domestic animals, big game, and non-game animals and for habitat considerations. It is not intended that original densities of shrubs be replaced on the reclaimed rangelands. We consider that species and habitat diversity enhances both the primary and secondary land use goals of rangeland and wildlife habitat, respectively.
- 8. Comment:** More specific mitigation measures should be included in the FEIS regarding land use, recreation, and wilderness. (16).

- Response:** Specific mitigation measures for construction, operation, and post-operation phases regarding these topics are provided in Appendix C-1. They are responsive to significant and many minor impacts. Mitigation measures of greater detail are not necessary for the identification of impacts in the EIS.
- 9. Comment:** Some of the mitigation measures regarding wilderness identified in the PDEIS were deleted in the DEIS. We believe they should have been included. (18).
- Response:** One mitigation measure was deleted which was originally in Appendix C of the PDEIS. It was shown in Table C-3 and C-5 (PDEIS table numbers) CONSTRUCTION AND OPERATION, Surface and Ground Water. It stated "Limit use of poisonous substances including pesticides, herbicides, or fungicides". It was dropped because use of such substances was not part of the CCSOP project description.
- 10. Comment:** What is the probability of the proposed revegetation program being successful? If such probability is low, what are the impacts which will result from partial revegetation? (11).
- Response:** At this time the probabilities of success of revegetation plans can be evaluated and necessary changes will be stipulated. The reader is also directed to Table 4.18-1, page 4-179 of the DEIS, where reclamation potential is estimated. Also, the CCSOP must obtain permits from various agencies for reclamation and revegetation of disturbed areas.
- 11. Comment:** It is suggested, on Table C-1-2 (page C-1-3) under CONSTRUCTION AND OPERATION - Surface and ground water contamination, mitigation number 6, that the last part of the statement, "lost to affected users", be dropped. (16).
- Response:** Concur.
- 12. Comment:** What mitigation measures are proposed to ameliorate impacts from corridor construction, such as impacts to creeks and streams from soil erosion and sedimentation? (42).
- Response:** Mitigation measures ameliorating such impacts are presented in Appendix C-1 in the FEIS. See Tables C-1-4, C-1-5, and C-1-6 under Surface and Ground Water Impacts.
- 13. Comment:** Regarding Table C-1-1 (page C-1-2) in the DEIS and the mitigation statement "Maintain surface water flows at Clear Creek Falls", is it feasible to do so? (16).
- Response:** Interception and storage of streamflow by mesa runoff storage reservoirs will reduce flows at the Clear Creek falls. The amount of flow depletion at Clear Creek falls depends on the CCSOP water usage from these reservoirs and amounts of releases. This is a recommended mitigation measure only, and has not received commitment from the Operator.
- 14. Comment:** What are the responsibilities of the Operator in repairing and/or compensating for failures of spent shale reclamation after the project is completed? (18).
- Response:** Reclamation responsibilities and performance standards are described in Colorado Mined Land Reclamation Board "Rules and Regulations for Mining of all Minerals Other Than Coal" (2CCR 407-1). The CCSOP must obtain permits from the MLRB and other agencies for reclamation and maintenance of spent shale disposal areas.
- 15. Comment:** Does the Operator plan to commit to all mitigation measures shown in Section 4.18 and Appendices C-1 and C-2 or only those measures which have been starred(*)? (42).
- Response:** The Operator has committed only the mitigation measures which were starred in the DEIS. Additional measures the Operator has committed to after publication of the DEIS are included in FEIS Appendices C-1 and C-2 as starred items.
- 16. Comment:** Additional mitigation discussion for the paleontology, cultural resources, and aquatics and wildlife disciplines should be included in the FEIS. (16)

- Response:** Concur. See revised Appendix C-1.
- 17. Comment:** Discuss more fully the environmental implications of delay or abandonment of the project, and the mitigation measures proposed to address impacts to soil, water quality, and aquatic and terrestrial ecology matters. (11, 42).
- Response:** The environmental implications of erosion of abandoned construction sites from early project shutdown will be addressed in the mining and reclamation permit. Impacts to soil, water quality, and aquatic and terrestrial ecology would therefore be minimized. Awareness by CMLRD of the Colony Project impacts will help to ensure that such contingencies are provided for in the permit. Further, a visit to the Colony Project site demonstrates that early shutdown or project delay has not caused inattention to the sites regarding reclamation matters.
- 18. Comment:** The mitigation section needs to be expanded. (42, 49).
- Response:** The mitigation section has been expanded in the FEIS (see Section 4.18), as have detailed mitigation Appendices C-1 and C-2.
- 19. Comment:** Mitigation measures might more usefully be incorporated into the Environmental Consequences Chapter of the EIS. (19, 42).
- Response:** Mitigation is addressed in general comments throughout the Environmental Consequences Chapter (4.0). BLM felt that it would be more advantageous for the reader to organize and summarize mitigation for each discipline in one Section (4.18), and then provide details in Appendices (C-1 and C-2). All of these sections are updated and reprinted in the FEIS.
- 20. Comment:** BLM should require (for purposes of issuance of right-of-way permits) committed mitigation from the Operator on both BLM and non-federal lands regarding projects impacts on wildlife, aquatic ecology, vegetation, surface and ground water, topography, geology, socioeconomic, air quality, and noise, and other environmental areas. (18, 22, 38, 39).
- Response:** It is BLM policy not to attempt to require off-site mitigation for various impacts to non-BLM lands. The primary reason for this policy is that local governments can (and do) require this type of mitigation as part of their use permits. The counties can identify their needs more precisely than BLM, and the counties are also in a better position to monitor the application and success of such mitigation measures. One of the purposes of the EIS is to fully disclose, as best it can, all project impacts for purposes of consideration by other regulatory authorities. It should be noted here, as well, that the Operator has committed to additional mitigation, especially concerning wildlife, in the FEIS. See revised Section 4.18 and Appendix C-1.
- 21. Comment:** The safety precautions and equipment which the Operator proposes to use to reduce pipeline spills and instigate clean-up should be addressed. (18).
- Response:** The Operator has committed to some mitigation of this type (see Appendix C-1), while other resources are recommended by BLM. BLM feels confident that adequate spill prevention and clean-up procedures will be required as stipulations in rights-of-way and other regulatory conditions of pipeline construction and operation.
- 22. Comment:** More details should be given on mitigation as committed to by the Operator. (38).
- Response:** Section 4.18 outlines the Operator's general approach to commitments regarding mitigation of socioeconomic impacts. More details, including some commitments on specific matters, are given in Appendix C-2. Both have been revised and reprinted in the FEIS. Such statements are adequate for purposes of the EIS. Local permitting processes will further define Operator's committed mitigation for socioeconomic impacts.

5.3.17 Unavoidable Adverse Impacts

- 1. Comment:** Minor clarifications and changes are needed in Sections 4.15 through 4.17 of the DEIS regarding unavoidable adverse impacts and related procedural matters which the EIS must address. (44, 16, 25).

Response: Concur.

5.3.18 Glossary and References

Glossary

- 1. Comment:** On page 7-1, Glossary of Terms, a list of acronyms and abbreviations would be helpful. (16).

Response: Acronyms and abbreviations are defined for the first usage in the EIS text. Redefinition is not deemed necessary.

References

- 1. Comment:** References for GCC reports have been incorrectly cited. (14, 15, 16).

Response: Concur. References have been corrected and inserted into BLM files. References for FEIS are only for documents cited within text of the document.

- 2. Comment:** The source for BLM (1980a) on Figure 3.8-1 is not in the references. (14).

Response: Disagree. The reference "BLM 1980a" is in the references as the White River Resource Area Grazing Management EIS.

5.4 Comment Letters and Hearing Transcripts



Grand River Hospital District

Cherry Memorial Hospital
E. Deane Moore Memorial Home
Grand River Home Health
Grand River Hospital

March 29, 1983

P.O. Box 912 • 101 East 1st St. • Rifle, Colorado 81650 • 303-623-1530

Chevron Environmental Impact
Statement Team Leader
Bureau of Land Management
764 Harrison Drive
Grand Junction, Colorado 81501

Re: Clear Creek Project
Health Facilities Review
Page 4-145

Dear Sir:

The statement mentions that Grand River Hospital District has filed an application for a clinic and emergency center at Battlement Mesa. It also mentions that Battlement Mesa, Inc. had contracted with a private firm to develop a clinic at Battlement Mesa. With the shutdown of the Exxon Colony Project, both of the above plans have been discontinued.

Therefore, it will require advance tax planning, loan guarantees or some other method provided by Chevron to the Grand River Hospital District for the establishment of the community clinic and emergency center which is required according to the EIS. Grand River Hospital District requests that the EIS recognizes this fact, and that Chevron include such guarantees in their request for permits and other approvals.

Sincerely,

Thomas A. Nord
Thomas A. Nord
Administrator

TAN/ton
JCC: Garfield County Commissioners



United States Department of the Interior OFFICE OF SURFACE MINING Reclamation and Enforcement BUREAU OF LAND MANAGEMENT 1000 NEW STREET DENVER, COLORADO 80202

April 7, 1983

Chevron EIS Team Leader
Bureau of Land Management
764 Harrison Drive
Grand Junction, Colorado 81501

Dear Sir:

Thank you for sending us a copy of the Clear Creek Shale Oil Project draft environmental impact statement (EIS) for our review and comment.

We have reviewed the draft EIS and have no comments at the present time. OSM feels there is no significant impact or serious conflict with this agency's responsibilities under the provisions of the Surface Mining Control and Reclamation Act of 1977 should this project be implemented.

Once again, thank you for the opportunity to comment. When the final EIS has been prepared, we would appreciate receiving four copies. If you have any further questions, please direct them to Charles W. Albrecht, Chief, Environmental Analysis Branch, Western Technical Center, (PWS) 327-5656.

Sincerely,

Alan S. Kline
Alan S. Kline
Administrator
Western Technical Center

RECEIVED
APR 11 1983
BUREAU OF LAND MANAGEMENT
DENVER, COLORADO



CITY - COUNTY PLANNING

Grand Junction-Mesa County 559 White Ave. rm. 60 Grand Jct., Colo. 81501
(903) 244-1628

April 7, 1983

Mr. Robert Kline
Chevron EIS Team Leader
Bureau of Land Management
764 Harrison Drive
Grand Junction, CO 81501

Dear Mr. Kline:

The City of Grand Junction Planning Department has reviewed the Clear Creek Shale Oil Project EIS and strongly recommends the Fracture Alternative (BLM's Preferred Alternative). Access should be via S.H. 139 rather than 16 Road due to the adverse impacts on present land uses along 16 Road.

Sincerely,

Karl G. Nelson
Karl G. Nelson
City Planning Director
G2N/mw

RECEIVED
APR 11 1983
CITY-COUNTY PLANNING
GRAND JUNCTION, CO

3

The original of this letter is hand written; it was typed for clarity prior to reproduction here.

April 11, 1983

1107 Bookcliff, Apt. 8
Grand Jct., CO 81501

Mr. Robert Kline, Team Leader
BLM, Grand Junction Office
Grand Jct., CO 81501

Dear Mr. Kline:

I wish to submit comment with regard to the Chevron Oil Shale project. Because of the vast nature of the EIS document, I will comment only on certain portions of the document.

1) Use of the Roan Creek corridor, the Upper Dry Fork reservoir site and other possible sites as of yet unpermitted would significantly affect areas known to support candidate and threatened plant species. Populations of serotinous alders and Phacelia subspecies are found in the corridor and reservoir site.

Last summer I participated in the search for the well Phacelia. Although large numbers of this annual were found, it is locally endemic. The encouraging amount of water and other favorable climatic factors augmented the crew. In other years we might not have found so many. Maintenance of the populations near unique through habitat preservation is essential. During this field search, I did not find the cactus, but others did.

I think it most important to maintain the integrity of these candidate and threatened species. The EIS does not properly address how Chevron will protect those species that I mentioned as well as the other plant and animal species listed in the EIS.

2) Construction of the Low and Leakey intake sites and other ancillary development in the Fracture and Leakey areas (if it occurs) could adversely affect the Bald Eagle's nesting on the Calapah River near these sites. Construction must not occur during the nest building and/or breeding periods. Status of this joint must be stated more clearly in the EIS.

3) The ability for the public to review the Biological Assessment and the Cooperation Report is important. How will these documents be made available to the public and what will they deal with? The EIS should have stated this.

4) The EIS mentioned currently that 450 trucks/day are needed to transport coal. For operational purposes at the Roan Creek corridor, the EIS does not address the problem significantly increased by such a large traffic volume. Are not highway tolls increased? Is the projected 150 increase documented or exclusive to the EIS? Will it increase in hydrocarbons appropriate the

4

Only an illusion to a railroad spur is mentioned. I suggest a railroad line be considered with the realization of certain impacts incurred by such a construction effort. The impacts from truck or railroad transportation must be considered in order to assess the incredible impact that such a traffic flow could produce.

5) If one of the Frutite alternatives is implemented, I suggest use of the Dorchester multiple use corridor as the preferred corridor for transporting goods from the upgrazing facility to the main railroads. This would relieve pressure on 16 Road and surrounding valley which is so essential to the maintenance of that rural environment.

6) Water, being such a controversial subject in this valley, I suggest making closely at the levels of added salts to the Colorado River system from this project and the reservoir projects. At this time, the Colorado Salinity Control project is plugging away in the Grand Valley trying to decrease salt loading into the river system. The Dils suggests that salinity levels will increase by 8 mg/liter in the Colorado River. Projected levels of salinity concentration reduction at the completion of the Grand Valley projects are 40 mg/liter as stated in the Salinity Update January 1983, Bureau of Reclamation.

A possible 20% increase overall in salinity concentration could occur if certain reservoir scenarios were implemented as deduced from the above information. If, as in the case of one entity will maintain the other's working status, in this case, the continual need to reduce salinity levels will be increased by certain projects. Will Chevron, if not allow them with the companies involved in the building the DEC reservoir, deal with such problems as salt concentration loading in the river system? (Clarification concerns in which corridors belong to which alternative is necessary. Presented as is, the document is confusing. Will one of the Frutto alternatives be implemented along with the preferred alternative at a later date?)

Summarizing, the document is well written and comprehensive. Many things I have failed to comment on are due to lack of time and knowledge. Thank you for the opportunity to comment on such an extensive project.

Sincerely,

Jas/ Lynn S. Cudlip

April 14, 1983

TO: Mr. Bob Kline
Chevron EIS Team Leader
Bureau of Land Management
766 Horizon Drive
Grand Junction, CO 81509

FROM: Sandi Knudson, Regional
American Lung Association

RE: Chubbuck EIS

I attended the Grand Junction public hearing on the Chevron EIS on April 4th, 1993 and made a brief statement on behalf of the American Lung Association of Colorado. However, at that time I had not had an opportunity to thoroughly review the entire EIS. I have now completed that review and would like the following comments included in the hearing record.

The single goal of the American Lung Association (ALA), its constituents and affiliates, is the prevention and control of lung disease. As such, a portion of our preventive program is concerned with the need for keeping the air around us as free from pollution as possible since both short-term exposure to high levels of air pollution and long-term exposure to lower levels, may produce adverse health effects. Therefore, our review of the EIS focused only on the potential direct and indirect air quality impacts on human health.

[illegible]

The "Christmas Seal" People

©

Mr. Bob Kline

Page 2

April 14, 1983

The EIS did not adequately address the potential health effects of proposed increases in air pollution levels. When considering potential health effects of suspended particulates, particle size is extremely important. Scientific findings show that particles of 10 microns or less can be deposited deep into the respiratory tract where a substantial portion may be deposited in the alveoli, or air sacs, or the lung—where they can remain for weeks or even years. Also, fine particulates are often a complex mixture of pollutants whose combined effects on health are greater than those of any single pollutant in the mix.

We are aware that there currently is an national air quality standard for fine particulates. However, EPA has been sufficiently concerned with this issue to begin work on the establishment of a standard that would deal with particles in the 10 to 15 micron size range. We believe that the EIS should address the potential impact of particulate emissions in terms of both size and composition, plus address the potential health effects of such emissions on both healthy and sensitive populations.

Recent scientific findings indicate that subjects with even mild asthma may develop symptomatic attacks of wheezing, shortness of breath, cough, chest discomfort, and bronchospasm after brief exposures to air pollutants that have no measurable effect on the lungs and airways of healthy adults without asthma. Individuals with other chronic lung conditions may develop similar symptoms. The prevalence of asthma in the U.S. is somewhere between 5 and 20% depending on the criteria used to define the disease!

Children are also at particular risk. Before the ages 8 to 10, children do not have fully developed immune systems to combat respiratory pathogens and pollutants. In addition, a given ambient air pollutant will result in much higher pollutant dosages to children than adults because children's lung volume in relation to body size is much greater than that of adults; children's ventilation rates are higher than adult rates; children tend to spend more time outdoors than an adult, thereby increasing exposure to air pollution; and children tend to engage in more physical activity than adults, thus increasing the volume of air inhaled.

We believe the potential effects on the health of these sensitive groups are significant and of sufficient importance to receive at least some consideration and review in the rule.

Monitoring data indicates we are currently within the sulfur oxide standards. However, if increased utilization of coal for home heating continues, will we be in danger of violating the standard? Also, what is the contribution of Gary Refining Company to sulfur oxide levels in the area under review?

Although population projections and transportation needs are addressed, the EIS does not adequately consider the effects of increased population and resultant increases in traffic, heating, etc., on air quality. Current environmental law does not include a provision for "indirect sources". However, we believe they should be considered in the Chevron EIS if we are to have a true picture of the air quality impact of the proposed project and its various options.

Finally, the TIS has considered mitigation measures to offset a variety of projected impacts. No mitigation measures are offered in the area of air quality. Why not?

In conclusion, a reminder that our air is finite. The effects of air pollution are even more dangerous and widespread than calculated when the IPA was first created. All possible measures must be taken to insure the protection of this irreplaceable resource.

The original of this letter is hand written; it was typed for clarity prior to reproduction here.

DeBaque, CD
April 20, 1983

Robert Kline
GIS Team Leader
Bureau of Land Management
754 Horizon Drive
Grand Junction, CO 81505

Dear Hon

This is a follow-up to my comments at various meetings as to the inadequacy of the Clear Creek Shale Oil Project OGIS -

1. Joan Creek Access Road

DTIS fails to address the needs of the local residents in regards to a frontage or community road maintained separately from the project road -

- a. Present Roan Creek Road is a designated livestock driveway and the need for such a facility will exist for the foreseeable future.
- b. School bus route.
- c. Farm/machinery access to property along Roan Creek and Side Creeks.

11. Lunar Creek Wells:

Inadequate detail on the effect of Chevron's use of surface and ground water in the Clear Creek well field and Clear Creek itself. To the other users of surface water rights primarily from Dry Fork upstream to the heads of 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st, 32nd, 33rd, 34th, 35th, 36th, 37th, 38th, 39th, 40th, 41st, 42nd, 43rd, 44th, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th, 59th, 60th, 61st, 62nd, 63rd, 64th, 65th, 66th, 67th, 68th, 69th, 70th, 71st, 72nd, 73rd, 74th, 75th, 76th, 77th, 78th, 79th, 80th, 81st, 82nd, 83rd, 84th, 85th, 86th, 87th, 88th, 89th, 90th, 91st, 92nd, 93rd, 94th, 95th, 96th, 97th, 98th, 99th, 100th, 101st, 102nd, 103rd, 104th, 105th, 106th, 107th, 108th, 109th, 110th, 111th, 112th, 113th, 114th, 115th, 116th, 117th, 118th, 119th, 120th, 121st, 122nd, 123rd, 124th, 125th, 126th, 127th, 128th, 129th, 130th, 131st, 132nd, 133rd, 134th, 135th, 136th, 137th, 138th, 139th, 140th, 141st, 142nd, 143rd, 144th, 145th, 146th, 147th, 148th, 149th, 150th, 151st, 152nd, 153rd, 154th, 155th, 156th, 157th, 158th, 159th, 160th, 161st, 162nd, 163rd, 164th, 165th, 166th, 167th, 168th, 169th, 170th, 171st, 172nd, 173rd, 174th, 175th, 176th, 177th, 178th, 179th, 180th, 181st, 182nd, 183rd, 184th, 185th, 186th, 187th, 188th, 189th, 190th, 191st, 192nd, 193rd, 194th, 195th, 196th, 197th, 198th, 199th, 200th, 201st, 202nd, 203rd, 204th, 205th, 206th, 207th, 208th, 209th, 210th, 211st, 212th, 213th, 214th, 215th, 216th, 217th, 218th, 219th, 220th, 221st, 222nd, 223rd, 224th, 225th, 226th, 227th, 228th, 229th, 230th, 231st, 232nd, 233rd, 234th, 235th, 236th, 237th, 238th, 239th, 240th, 241st, 242nd, 243rd, 244th, 245th, 246th, 247th, 248th, 249th, 250th, 251st, 252nd, 253rd, 254th, 255th, 256th, 257th, 258th, 259th, 260th, 261st, 262nd, 263rd, 264th, 265th, 266th, 267th, 268th, 269th, 270th, 271st, 272nd, 273rd, 274th, 275th, 276th, 277th, 278th, 279th, 280th, 281st, 282nd, 283rd, 284th, 285th, 286th, 287th, 288th, 289th, 290th, 291st, 292nd, 293rd, 294th, 295th, 296th, 297th, 298th, 299th, 300th, 301st, 302nd, 303rd, 304th, 305th, 306th, 307th, 308th, 309th, 310th, 311st, 312th, 313th, 314th, 315th, 316th, 317th, 318th, 319th, 320th, 321st, 322nd, 323rd, 324th, 325th, 326th, 327th, 328th, 329th, 330th, 331st, 332nd, 333rd, 334th, 335th, 336th, 337th, 338th, 339th, 340th, 341st, 342nd, 343rd, 344th, 345th, 346th, 347th, 348th, 349th, 350th, 351st, 352nd, 353rd, 354th, 355th, 356th, 357th, 358th, 359th, 360th, 361st, 362nd, 363rd, 364th, 365th, 366th, 367th, 368th, 369th, 370th, 371st, 372nd, 373rd, 374th, 375th, 376th, 377th, 378th, 379th, 380th, 381st, 382nd, 383rd, 384th, 385th, 386th, 387th, 388th, 389th, 390th, 391st, 392nd, 393rd, 394th, 395th, 396th, 397th, 398th, 399th, 400th, 401st, 402nd, 403rd, 404th, 405th, 406th, 407th, 408th, 409th, 410th, 411st, 412th, 413th, 414th, 415th, 416th, 417th, 418th, 419th, 420th, 421st, 422nd, 423rd, 424th, 425th, 426th, 427th, 428th, 429th, 430th, 431st, 432nd, 433rd, 434th, 435th, 436th, 437th, 438th, 439th, 440th, 441st, 442nd, 443rd, 444th, 445th, 446th, 447th, 448th, 449th, 450th, 451st, 452nd, 453rd, 454th, 455th, 456th, 457th, 458th, 459th, 460th, 461st, 462nd, 463rd, 464th, 465th, 466th, 467th, 468th, 469th, 470th, 471st, 472nd, 473rd, 474th, 475th, 476th, 477th, 478th, 479th, 480th, 481st, 482nd, 483rd, 484th, 485th, 486th, 487th, 488th, 489th, 490th, 491st, 492nd, 493rd, 494th, 495th, 496th, 497th, 498th, 499th, 500th, 501st, 502nd, 503rd, 504th, 505th, 506th, 507th, 508th, 509th, 510th, 511st, 512th, 513th, 514th, 515th, 516th, 517th, 518th, 519th, 520th, 521st, 522nd, 523rd, 524th, 525th, 526th, 527th, 528th, 529th, 530th, 531st, 532nd, 533rd, 534th, 535th, 536th, 537th, 538th, 539th, 540th, 541st, 542nd, 543rd, 544th, 545th, 546th, 547th, 548th, 549th, 550th, 551st, 552nd, 553rd, 554th, 555th, 556th, 557th, 558th, 559th, 560th, 561st, 562nd, 563rd, 564th, 565th, 566th, 567th, 568th, 569th, 570th, 571st, 572nd, 573rd, 574th, 575th, 576th, 577th, 578th, 579th, 580th, 581st, 582nd, 583rd, 584th, 585th, 586th, 587th, 588th, 589th, 590th, 591st, 592nd, 593rd, 594th, 595th, 596th, 597th, 598th, 599th, 600th, 601st, 602nd, 603rd, 604th, 605th, 606th, 607th, 608th, 609th, 610th, 611st, 612th, 613th, 614th, 615th, 616th, 617th, 618th, 619th, 620th, 621st, 622nd, 623rd, 624th, 625th, 626th, 627th, 628th, 629th, 630th, 631st, 632nd, 633rd, 634th, 635th, 636th, 637th, 638th, 639th, 640th, 641st, 642nd, 643rd, 644th, 645th, 646th, 647th, 648th, 649th, 650th, 651st, 652nd, 653rd, 654th, 655th, 656th, 657th, 658th, 659th, 660th, 661st, 662nd, 663rd, 664th, 665th, 666th, 667th, 668th, 669th, 670th, 671st, 672nd, 673rd, 674th, 675th, 676th, 677th, 678th, 679th, 680th, 681st, 682nd, 683rd, 684th, 685th, 686th, 687th, 688th, 689th, 690th, 691st, 692nd, 693rd,

Rationale:

[illegible]

Chavron's consumptive use of this will water and the surface rights from Clear Creek could adversely affect both senior and junior water right holders in the area. This potential adverse effect and the mitigating measures to address the effects should be considered in the EIS.

III. Revegetation Plan

Maybe this is an opportune time for the BLM to update, revise and give consistency to the revegetation plan.

Rationale:

- BLM has programs in the past and also plans for summer of '83 to eradicate Big Sage, rabbit brush, service brush and delphinium by burning. Why then do we insist that the Chavron revegetation plan necessitates the replanting of these same species?
- Even the argument that they supply some amount of winter range for game animals doesn't make sense if the elevations we're addressing.
- Let's plant desirable species of grass and the natural seeds that are in the topsoil will undoubtedly be plenty to establish a brush density again.

The DEIS should address the need for upgrading the plant canopy and the probability of eventually having more than adequate brush regrowth through natural seed left in the top soil.

IV. Fruits I Alternative:

DEIS doesn't adequately address or define the justification for the need to impact the enormous amount of additional surrounding land areas, land uses, and the destruction of one of the few remaining undisturbed areas of primitive natural beauty, i.e., Salt Wash, Mesa Top around head of Rose Creek, Carr Creek, Rabbit Creek.

Rationale:

- Clear Creek alternate is much less offensive and confines the activities into one area, thereby lessening the impacts on surrounding land owners and land uses. The Fruits I alternate surely can't justify the destruction of this amount of previously undisturbed portion of western Colorado when other alternatives are available that would not necessitate this.
- Economics of the Fruits I alternate have got to be out of reason - especially if the final product is connected into the local pipeline.

- I question the statements that have been made in regards to the air quality studies - with Grand Junction, and the Grand Valley already having a "roadside" problem. How can the area be impacted with the location of the final project, increased population, increased vehicular traffic, etc., to contribute to an already existing problem? Again I question how the 100,000 bushels of I alternate could have passed the air quality standards.

V. Deleage Community:

The DEIS should address the efficiency, convenience and overall justification of the majority of the workforce and personnel associated with the CSOP K-1 line in and around the Deleage Community - the potential for the DEIS to address this is nearly unlimited. Here's a few examples:

- Efficiency of travel time to and from work.
- Convenience of worker relationships when supporting the same community efforts.
- NOTE: How can two guys work together and be attentive to their job when one is a son of one Deleage's basketball team and the other has a son playing for Telluride and the championship game is being played the next night - just a thought?
- Job relationship and effectiveness: What effect does another 50 miles and 2 hour of travel both night and morning have on a persons performance on the job?
- Differences in costs of mass transit system.
- Mental strain of employees.
- Differences in air quality by the elimination of vehicular travel.

VI. Hazardous Wastes

The DEIS doesn't adequately address hazardous waste sites.

I appreciate the opportunity to present my comments on the CSOP DEIS and hope that due to the adequacy of the DEIS to fully address a very complicated and far-reaching impact on our livelihood and lifestyle in western Garfield County.

Sincerely,

1/s/ Gale B. Albertson

GARFIELD COUNTY Board of County Commissioners

CLAYTON J. CERRIS
DANIEL C. CERRIS
LARRY VILLASQUE
DANIEL A. GONZALES
EUGENE J. DUNN
DANIEL A. CERRIS

April 25, 1983

COMMISSIONERS' MEETING
201 N. 1st St., P.O. Box 100
Garfield County, Colorado 81602
Telephone: (303) 665-1100
S. R. STAN SHOOVE
County Manager

Robert Kline
Clear Creek Shale Oil Project EIS Team Leader
Bureau of Land Management
764 Holman Drive
Grand Junction, CO 81501

Re: Draft Environmental Impact Statement Clear Creek Shale Oil Project

Dear Mr. Kline,

The Garfield County Board of County Commissioners appreciates the opportunity to submit comments on the above captioned DEIS. The board notes that, in general terms, the Draft Environmental Impact Statement was well prepared and will become a valuable aid to our decision making process.

There are, however, four topics that the Board feels are not adequately addressed in the DEIS.

- Hazardous waste disposal is not adequately addressed in the DEIS. This issue needs to be more fully explored and the internal inconsistencies eliminated in the Final Environmental Impact Statement.
- Adherence to existing air quality standards should adequately address the potential air quality degradation issue. However, additional information would be included to address odor mitigation and control.
- Garfield County concurs that mitigation techniques identified for water quality and water quantity are necessary and appropriate. The Clear Creek well field may have a serious deleterious physical impact on agricultural irrigation ditches and canals in the area (particularly from Dry Fort upstream to Rose Creek and its tributaries). This potential impact needs to be identified in the EIS. Specific mitigation measures will be required as part of the Garfield County land use permitting process.
- The socioeconomic implications of a significant change in the level of development including a delay or abandonment of the project needs to be more fully evaluated in the Final Environmental Impact Statement.

Page 2, Mr. Robert Kline

In addition to the above comments, it should be noted that prior to the development of the project, Garfield County will require applications for applicable land use permits. The details required for many of the County permits will exceed the standards required for the Environmental Impact Statement. The following comments are offered as examples of some of the EIS issues that will require additional and specific information for purposes of County permit review.

- The information provided in the DEIS on existing transportation infrastructure aspects and mitigation measures is generally adequate for the EIS. Much more detail will be required as part of the land use permitting process.
- Soils, aquatic ecology, terrestrial ecology, cultural and visual resource impacts are adequately identified in the DEIS. The mitigation suggestions and proposals need to be documented.
- The detail included in the socioeconomic assessment is adequate for identifying general socioeconomic impact trends of the various alternatives.

The socioeconomic assessment appears to be one of the most comprehensive reviews of socioeconomic issues to be included in an environmental impact statement. The socioeconomic assessment in itself is a valuable planning tool and is sufficient for EIS purposes except as noted below.

Garfield County, however, has some observations that need to be noted. The following items will definitely be addressed as part of the County land use permitting review but also need to be recognized as concerns at this time.

- The Garfield County Fiscal Impact Analysis will require a detailed re-evaluation and assessment of baseline data.
- The assumptions included in the assessment do not represent all of the socioeconomic issues that could be addressed. Garfield County Fiscal Impact regulations specifically identify the need for modification of the mitigation program to account for various development scenarios. For example, there may, in fact, be more impact on the economy or other than projected in the DEIS. Garfield County will require more detailed information in the Final Impact Mitigation Program to account for this potential.
- The Fiscal Impact Mitigation Program will entail a detailed review of methodologies as part of the County land use requirement.

7

5. The socioeconomic mitigation techniques identified in the DEIS are vague and represent corporate philosophy to a certain extent rather than a specific program. This is useful to Garfield County but is very inadequate in terms of complying with Garfield County regulations.
4. Land use, recreation and wilderness issues will need to be addressed as a part of the permit process in such a manner that the Planning Commission has the ability to properly designate Management District classifications per the County's Comprehensive Plan requirements. The general discussion in the DEIS is adequate for purposes of the EIS process.
5. Energy mitigation measures are acceptable, however, it is noted that hydro-electric generation has not been given consideration as a part of reservoir development and should be addressed in the final EIS as to whether or not it is feasible.

Garfield County has been extremely pleased with the preparation and progress of the Draft Environmental Impact Statement. The thorough evaluation of socioeconomic issues as well as traditional physical/environmental concerns is consistent with the Board's policies towards industrial development review. The Board of County Commissioners submit these comments with the hope that the comments will be useful to the Bureau of Land Management during the preparation of the Final Environmental Impact Statement. If you have any questions or require additional information, do not hesitate to call.

Sincerely,

Jim Dickinson
Chairman

JDK:lv



BOARD OF
Mesa County
Commissioners
P.O. Box 897
Grand Junction, Colorado 81502

George R. White
County No. 1
Per-1402

Dick Pined
County No. 2
Per-1402

Carl Wiedenman
County Administrator
EIR-1002

Madeline Allers
County No. 3
Per-1402

Carl Wiedenman
County Administrator
EIR-1002

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APR 26 1983

RECEIVED
MESA COUNTY PLANNING COMMISSION

April 25, 1983

Chevron EIS Team Leader
Bureau of Land Management
714 Horizon Drive
Grand Junction, Co. 8151

Re: Review and Comment on Chevron DEIS

Dear Sir:

The Mesa County Planning Commission has reviewed and considered the Draft Environmental Impact Statement for the Clear Creek Oil Shale Project.

The following comments were approved by the Mesa County Planning Commission:

1. Mesa County congratulates Chevron, BLM, BLMPL for preparing an informative, useful and well organized socio-economic section of the E.I.S. The analysis and projections prepared as part of the Draft E.I.S. will provide an excellent framework for planning and growth management in Mesa County. We appreciate the fact that this E.I.S. has a wealth of information which is highly useful to us at the local level in day-to-day decision-making.
2. Mesa County would prefer the Fruita I Alternative. This would place the upgrade facility in Mesa County, offsetting the anticipated growth pressures and fiscal impact with a source of revenues demonstrated by the fiscal impact projections. It represents the most responsible balance of growth management consistent with Mesa County's Goals, Objectives and Policies.

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3. Mesa County would prefer the limitation of the use of 16 Road corridor as a major industrial transportation route. The preferred route would be the Douglas Pass Road (State Highway 139) rather than 16 Road.
4. Mesa County believes that the Chevron E.I.S. is an excellent planning tool for growth in the Grand Valley. We are concerned, however, that the socio-economic and fiscal impact analysis falls short of a growth management program. We urge the amplification of the E.I.S. to a growth management program for Mesa County. The growth management program would require extensive input of the Mesa County Planning Commission, the Mesa County Commissioners and the general public.
5. Mesa County requests that all hazardous waste sites be identified in the E.I.S. and that the proper environmental mitigation measures be taken to reduce the danger of these sites to public health and safety.
6. Mesa County requests more detailed information on transportation to and from the facility, including projected average daily traffic and proposed transportation improvements.
7. Mesa County would urge the consideration of the impact of the project on agriculture. The oil shale facility and appurtenant facilities should be designed to minimize disruption of agriculture, including dust mitigation, mitigation of commercial/industrial/mining traffic on farm roads, and mitigation of adverse impacts on normal farming practices.
8. Mesa County would prefer the limitation of through traffic on BLM land. Roads to the upgrade facility should be one lane

2

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access roads only.

We look forward to working with Chevron and BLM to resolve problems when and if the project goes forward.

Sincerely,

Maxine Allers
Maxine Allers, Chairman
Mesa County Commissioners

cc:

Mike Rock, Chevron
Bill Lamm, BLM
Jim Young, Mesa County Planning Commission
Dennis Stranger, Garfield Co Planning Director

3



RECEIVED
CITY - COUNTY PLANNING
grand junction-mesa county 559 white ave. rm. 60 grand jct.co.az 81501
(303) 244-1628

April 21, 1993

Chevron EIS Team Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, CO 81501

Re: Review and Comment on Chevron EIS

Dear Sir:

The Mesa County Planning Commission has reviewed and considered the Draft Environmental Impact Statement for the Clear Creek Oil Shale Project.

The following comments were approved by the Mesa County Planning Commission:

1. Mesa County congratulates Chevron, BLM and BMM for preparing an informative, useful and well organized socio-economic section of the E.I.S. The analysis and projections prepared as part of the Draft E.I.S. will provide an excellent framework for planning and growth management in Mesa County. We appreciate the fact that this E.I.S. has a wealth of information which is highly useful to us at the local level in day-to-day decision-making.
2. Mesa County would prefer the Fraute I Alternative. This would place the upgrade facility in Mesa County, offsetting the anticipated growth pressures and fiscal impact with a source of revenue as demonstrated by the fiscal impact projections. It recommends the most responsible balance of growth management consistent with Mesa County's Goals, Objectives and Policies.
3. Mesa County would prefer the limitation of the use of 16 Road corridor as a major industrial transportation route. The preferred route is the Douglas Pass Road (State Rwy. #139) rather than 16 Road.
4. Mesa County believes that the Chevron E.I.S. is an excellent planning tool for growth in the Grand Valley. We are concerned, however, that the socio-economic and fiscal impact

Letter to Chevron EIS Team Leader
April 21, 1993
Page 2

analysis falls short of a growth management program. We urge the amplification of the E.I.S. to a growth management program for Mesa County. The growth management program would require extensive input of the Mesa County Planning Commission, the Mesa County Commissioners and the general public.

5. Mesa County requests that all hazardous waste sites be identified in the E.I.S. and that proper environmental mitigation measures be taken to reduce the number of sites to public health and safety.
6. Mesa County requests more detailed information on transportation to and from the facility, including projected average daily traffic and proposed transportation improvement.
7. Mesa County would urge the consideration of the impact of the project on agriculture. The oil shale facility and ancillary facilities should be designed to minimize disruption of agriculture, including dust mitigation, mitigation of commercial/industrial/mining traffic on farm roads, and mitigation of adverse impact on normal farming practices.
8. Mesa County would prefer the limitation of through traffic on 16 Road. Roads to the upgrade facility should be one lane access roads only.

We look forward to working with Chevron and BLM to resolve problems when and if the project goes forward.

Sincerely,

Jim Young, Chairman, Mesa County Planning Commission

cc:

Mr. Mike Reek, Chevron
Bill Lambert, BMM
Pete Albosta, Mesa Co. Commissioner
Dennis Branner, Garfield Co. Planning Dir.



United States Department of the Interior

BUREAU OF RECLAMATION
UTTER COLONY ROAD OFFICE
PO BOX 1006
SALT LAKE CITY, UTAH 84143

DATE: MAY 10-93
120.1

APR 26 1993

Memorandum

To: Chevron EIS Team Leader, Bureau of Land Management, 764 Horizon Drive, Grand Junction, Colorado 81501

From: Regional Director, Bureau of Reclamation

Subject: Review of Bureau of Land Management's Draft Environmental Statement on the Clear Creek Shale Oil Project (SIS 93/3)

We have reviewed the above Draft Environmental Statement (DES) and have the following comments to offer:

Summary

Our review of the subject statement focused on the water supply alternatives and salinity impacts of the proposed project. Per a required water supply of 26,000 acre-feet per year, the only alternatives presented included three different river diversion locations and two well completion systems. One alternative water source, as proposed by Reclamation's (Grand-Junction) Spring Valley contract well, was not considered or addressed. In essence, a projected 15,000 acre-feet per year saline water pipeline (under current planning investigations) may be routed right through the three proposed diversion locations for the project; thus, alternative saline water sources/supplies, such as Reclamation's Grand-Junction Salinity Control Project and agricultural drainage in the Grand Valley, may be available for use by the Clear Creek Shale Oil Project. The alternative water sources (or blended supply) should be addressed in the Final Environmental Statement (FES).

The Cumulative Environmental Impacts section of the statement did not address the cumulative effects of other related energy development projects in the region on water supply and water quality. A significant effort was made in the analysis to detail air quality impacts from Colorado and Utah synfuels and powerplant development to the year 2020; thus, this important section of the statement does not present a complete or balanced perspective of cumulative impacts on water resources.

Facilities of the Bureau of Reclamation's Grand Valley Project would be affected by several alternatives in the project and area. Water conservation facilities would be covered by transportation and utility contracts. Reclamation's Grand Junction Project Office is available to work with your agency on the Clear Creek Shale Oil Project on necessary design measures and agreements for these changes.

Summary

2

Page 2-35 to 2-31 - The estimated water requirements for the 100,000 BPO production level are too general to provide useful information on actual water use; for example, according to the power requirements stated on page 2-31, 138 mcf of power will be generated onsite to meet part of the project power requirements. A corresponding water requirement for powerplant cooling cannot be determined from the information presented. It is suggested that a breakdown of water use for the plant and related facilities be provided in the FES. Also, please clarify/enhance the steel water requirement for the project and/or 500,000 gallon venture. A later multiple of salinity impacts (page 4-42) shows two levels of projected water use of 26,000 acre-feet/year for Clear Creek and 72,000 acre-feet/year for the GCM plant venture. Other than the large storage reservoir (175,000 acre-feet) proposed for Bore Creek, there is only limited discussion of the ultimate water requirements and related impacts.

Page 6-10 - Change "water withdrawal from surface streams could deplete stream-flow of the Colorado River . . ." to . . . would deplete streamflow . . .

Page 6-12 - It is noted that all process and plant wastewater will be used through a water treatment system before being released to a adjacent reservoir on Clear Creek. Please provide more description of the treatment and reservoir system in terms of meeting zero discharge requirements, particularly in the case of potential salt loading.

Page 6-12 - The water use condition of 250,000 acre-feet/year water withdrawal from the river system should be clarified. Apparently, this is a unique reservoir-filling condition that will not be repeated. Moreover, it should be emphasized that this analysis only considers salt concentrating effects over the life of the project. It was also assumed that the zero discharge treatment and reservoir systems will avoid any salt loading from the facilities, although this is not discussed or addressed in a direct manner.

Page 6-55 and Page 6-55 to 6-57 - Because of the sheer magnitude of the Spect shaft disposal problem (800 to 900 million cubic yards covering 2,000 to 3,000 acres) and the nearby mine land (6,000 to 10,000 mgl TDS) leachates (despite the dilution of surface and ground water systems), the water treatment and/or quantification of potential salt loading should be provided. On page 6-56, the complexities of the mechanical processes involved, but with the limited data available (surface flow, precipitation, salt pickup rate, permeability, etc.), more potential "worst-case" loading estimates should be discussed relative to Clear Creek drainage and the Colorado River. On page 6-56, it states that there is leachate contamination of the groundwaters due to liner failure, yet no reference in the text to the modes or probability of liner failure. Finally, there should be some discussion of design and operation of the sedimentation pond and downstream storage reservoir to mitigate the effects of potential salt loading due to shale leaching and mine dewatering.

Page 6-60 to 6-61 - The direct impact of the project on farmland is described. The indirect impacts caused by siting of a major industry with its associated work force, utility contracts, etc., in the Grand Valley, and by converting irrigation water to industrial uses may have much more significant impacts on agriculture.

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Page 4-72 - It is concluded that variable water levels in project reservoirs would probably preclude a fishery. An operation study is needed to substantiate this. Some fluctuating reservoir operations could fisheries. If these reservoirs are built on public lands, consideration should be given to making them available for public recreation.

Page 4-73 Table 4.3-3 - This table is titled "Water withdrawal rates and Colorado River flows". It presents monthly diversion rates and patterns of river flow diverted. The table does not present a realistic estimate of diversions, however, because the diversions shown far exceed the project water needs. The project water supply studies should provide average monthly diversions and average monthly changes to Colorado River flows.

Page 4-73 - Flow recommendations for the maintenance of present production levels of Colorado squawfish and humpback shub for the Colorado/Ora state line are shown. The statement is made that it is possible that water withdrawals could result in flow reductions below those recommended levels. The FIS should recognize that these flows are not always met at present.

Page 4-76 - The report states that up to 1,500 acres of agriculture land could be impacted. As indicated here, indirect impacts may be even greater.

Page 4-81 - The statement is made that a relatively large population of the threatened species *Salicapsylla* planning would be effected by construction of Upper Dry Fork Reservoir. What does "affected" mean? Does this indicate that the entire population is in the reservoir basin and will be lost?

Page 4-81 - This section of the FIS recognizes cumulative impacts of the project, but does not present sufficient data or analysis. The cumulative impact of this and similar actions (e.g., Boreman-Gel Lagoon, other oil shale projects) may have very significant impacts on air quality, wildlife, water quality, agriculture, and other environmental factors that should be recognized.

Table 4.3-10 - This table should show acres of private land to be acquired for right-of-way.

If you have any questions about these comments, please contact Mr. Harold Seinfeld at this office (Phone 718-380-1000).

[Handwritten signature]

Emory Elms
Elms Town Leader
Elms of Land Management
344 Harrison Drive
Grand Junction CO 81501

Dear Sir:

I have read the draft FIS for the Clear Creek Oil Shale project, and I am several areas where the draft FIS could be improved. The following comments address areas areas and suggest possible improvements for the final FIS. The areas addressed are indicated as follows:

- Purpose and Need
- The treatment of the No Action Alternative
- Consideration of shuntwater impacts
- Socioeconomic impacts
- Spent shale disposal
- Cumulative impacts on surface water

Purpose and Need

In the discussion of "Purpose and Need for the Project" in Section 1.5, the purpose of the project is described as "to produce shale oil in an environmentally and economically acceptable manner". This is followed by a discussion of America's need for energy independence. What is missing is a discussion of why shale oil should be considered to be a potential response to energy shortages. Shale oil is considered by many to be the cleanest, most abundant and economically destructive alternative energy source. It would be helpful to compare the relative attractiveness of shale oil with other synthetic fuels, and with other energy alternatives. In this way it would be made clear how the "purpose" of the project relates to the "need" i.e. energy independence.

The No Action Alternative

The National Environmental Policy Act of 1969 mandates that the no action alternative must be considered in an EIS. In the draft FIS, the no action alternative is mentioned, included in tables, but never taken seriously as an alternative. Clear evidence of this oversight is found in Section 2.4.1.1 "WMA" "Preferred Alternative". The WMA identifies the Clear Creek project configuration at 30,000gpd

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as the environmentally preferred alternative considering only the biological environment. But in the impact comparisons in Table 2.4.1.1 on p.2-37, the CO-50 configuration is shown to have much more negative environmental impacts than the no action alternative. The choice of the CO-50 configuration as the environmentally preferred alternative despite a demonstrably more severe negative environmental impact than the no action alternative demonstrates the lack of consideration of the no action alternative. The final FIS should be improved by serious consideration of the no action alternative.

Consideration of Shuntwater Impacts

Nowhere in the draft FIS is the possibility of a postponement or cancellation of the project after construction by excess diversions. In view of what we know about the Basin Geology project, this cannot be eliminated as an unlikely possibility. A shutdown of the project after construction is underway would have serious socioeconomic impacts as well as impacts on soil, water quality, and aquatic and terrestrial ecology due to erosion from floodplains and abandoned construction sites. The possibility of project shutdown or delay after construction is underway is a potential source of negative impacts that should be considered in the final FIS.

Socioeconomic Impacts

The analysis of socioeconomic impacts is excellent and the proposed mitigations appear to be of state of the art quality in baseload impact mitigation. However, none of these mitigations are permanent. The actual mitigation and implementation of specific mitigation programs would be based upon negotiations with local officials at the time of project development. (p.4-176) These mitigations to be undertaken by the Operator all cost money. Considering that shale oil must compete with other energy sources in price and that domestic flow-through in energy prices are likely to continue into the future, it is very possible that the Operator may be forced into cost-cutting measures in order to keep the facility open. Socioeconomic impact measures could be the first expense to be cut in such circumstances. If the alternative was the closing of the project, local officials would have little choice but to agree to such cost-cutting measures. This could result in negative socioeconomic impacts. This possibility should be considered in the final FIS.

Spent Shale Disposal

In the matter of spent shale disposal, there are several areas in which the analysis might be clarified or improved.

On p.2-27 a description is given of the spent shale disposal process, along with measures to prevent seepage and erosion, and to prepare for eventual revegetation. It would be helpful to include a description of the events in this procedure. Such a description would give some idea of how long the spent shale would be left open by the elements, with the associated problems brought about by such exposure, such as erosion, runoff of sediment into waterways, dust, and water infiltration into the pile, causing leaching. Without such a sequential description, it is impossible to evaluate the potential effectiveness of the proposed method of spent shale disposal.

In the discussion of groundwater impacts from spent shale disposal on p.2-39, reference is made to the possible failure of the liner which is to prevent leaching of contaminants into the Boreman Creek Aquifer. It is said that "Should the liner fail, the concentrations of Sulfate, Cyanide, Ammonia, and Chloride could increase." (p.2-39) In view of the possibility of such groundwater quality deterioration, there should be some discussion of the probability of liner failure. Without such a discussion, there is no way to know how serious of a problem this is.

The issue of revegetation of spent shale disposal areas is discussed in the draft FIS, mainly on p.2-35. This discussion lacks a detailed treatment of the probability that the revegetation program described would be successful under the arid conditions prevailing at the site. It is also important to know the possible impacts of a partial or complete failure to revegetate, such as erosion, water quality deterioration from runoff, and weathering of the liner, leading to water infiltration. The probabilities of revegetation success, and the possible impacts of failure should be addressed in the final FIS.

The substance or "failure" of the spent shale disposal site is described as inevitable on p.2-78. "Some time after reclamation and proper abandonment, failure of the spent shale disposal area would occur as a result of natural erosional processes." Such a major event, described as inevitable, merits a more thorough treatment than is given. The final FIS should describe the water quality impacts in as much detail as is feasible. Some accurate representation of the likely time period for subsidence would be helpful as well.

Cumulative Impacts on Surface Water

It is stated that the withdrawal of large quantities of water from the Colorado River system will result in stream flow depletion. In the treatment of project impacts in Section 4.4.1 and in the treatment of cumulative impacts in Section 4.4.1.1,

It is stated that 10% of the mean annual flow of the Colorado River at that point would be diverted as De Beque if maximum amounts are withdrawn. Here consideration of mean annual flow is not a complete worst case analysis. In addition, the percentage of water diverted under maximum withdrawal under low flow conditions would have to be calculated. It would be helpful to include such an analysis in the final EIS. It would also be useful to discuss in more detail the exact nature of impacts resulting from stream flow depletion on the Colorado River.

In conclusion, I hope that at least some of these comments will be helpful to you in the preparation of the final EIS.

Sincerely,

Michael Duran

Mr. Robert Kline
EIS Team Leader
Bureau of Land Management
The Horizon Drive
Grand Junction, CO 81501

RE: Clear Creek Shale Oil Project EIS

Dear Bob:

I don't believe in beating around the bush, although it is obvious that you all do, so I'll get right on you. The referred to EIS is inadequate, misleading and manipulative propaganda-though I'm just about what I suspected from you folks.

The specifics:

1. This EIS inadequately describes the environmental impacts resulting in Cumulative Impacts, Section 4.14. a) Air Quality and Meteorology: First of all, your tables refer to a source in Utah named, "Westers", this so-called "Westers" project is not discussed in any of the other recently released regional EISs, so, please inform us, if you're able, as to the specifics of this mystery project. Secondly, your tables do not include TMDL's load wash project nor Mulecitra's Cottonwood Wash Project, both of which claim to have applied for RFD permits. Therefore, your discussion in Section 4.14.2 is not adequate. Further, assuming you all manage to include the proper emissions source in your tables, the manner in which you present the impacts, that is, nothing but simple presentations of rows and columns of numbers, does not adequately inform the people of this country as to the reality of the impacts. To be least misleading the final EIS should consider explaining the meanings of all these numbers. Try for example, something like, "The total TMDL emissions from the proposed synfuel projects would be 100,000 tons per year."

b) Water Resources: this is by far the most profoundly inadequate discussion of the Cumulative Impacts section. You grossly mislead the people of this country by not explaining that the cumulative water needs of the Union, Superior-Pacifica, Mobil, and Chevron's Clear Creek projects will result in serious water shortages downstream, and throughout the lower Colorado River Basin. Further, there is no discussion of the combined effects on salinity. Therefore, I request that the final

Page 2

EIS include a clearly understandable explanation of: the total water needs of all the proposed synfuel projects in Colorado, the total depletion of the Colorado River system as a result of these proposed projects and the average stream flow that the Colorado River has at present and can expect in the future, as a result of the proposed projects, at a river gauging station near Grand Junction. Then, it might be clear enough for the people to realize that severe water shortages are possible in and around Grand Junction. (One additional question, are you all trying to suggest these water impacts with your proposal in now down all the "space between light and classroom bright? Same, so.)

2. This EIS is deceiving the people in its discussion of net energy analysis, Section 4.13.1. First of all you all do not adequately explain your so-called methodology. Simply referring to your in-house handbook does not fulfill your legal obligation to fairly relate the expected consequences of these proposed projects. Further, I maintain that your estimations of net energy gains ranging from 3.0 to 3.4 (1) are not correct. In fact, I challenge you to prove these results and provide your complete calculations in the final EIS. I maintain that the net energy will be around 1.1 and again, challenge you to prove me wrong. This whole section smells of manipulative propaganda. Doesn't the BLM have any integrity any more, or did that go with your house air?

In conclusion, I request that the final EIS on the Clear Creek Shale Oil Project remove the above mentioned inadequacies and fulfill its legal obligations to clearly inform the people of the country of the environmental consequences of the proposed actions. It would also be nice of you all to be as accurate as you can be.

Very truly yours,

Freddie Frank

cc: Richard Hughes, DWP

Getty Oil Company 3810 Wilshire Boulevard, Los Angeles, California 90010 Telephone (213) 739-3021

Western Production Department

April 27, 1983

TO: Mr. Robert Kline, Team Leader
Bureau of Land Management
Grand Junction District
764 Horizon Dr.
Grand Junction, CO 81501

FROM: Mr. Carlos A. Zimmerman
Getty Oil Company
3810 Wilshire Blvd.
Los Angeles, CA 90010

SUBJECT: Review of Draft Environmental Impact Statement - Chevron Clear Creek Project.

Dear Mr. Kline:

Getty Oil Company has reviewed the above cited draft impact statement and find it to be a well written, informative document.

As one of Chevron's closest neighbors, who has extensive land holdings in both Clear Creek and San Joaquin, with senior water rights in the same area, we are particularly concerned with several items:

1. Drawdowns due to the proposed pumping from the alluvium are seriously under-estimated.
2. Alluvial and bedrock wells may be used for the entire life of the project.
3. The document is not consistent as to the degree of interconnection of ground and surface waters in the Clear Creek area.
4. The discussion ground water hydrology is found to be of academic interest but not of a site specific nature.

Specific concerns are outlined by page:

Page:

2-30 Well System: It is recognized that an augmentation plan is required to protect

Getty

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APR 29 1983

senior downstream appropriators. At present the proposed augmentation plan does not address the mesa wells or reservoirs proposed by Chevron.

- 3-32 Well System and Clear Creek Mesa System - The alluvial wells will be used for the entire project life, as necessary.

- 2-49 The methods of doing this are not presented in this document. For water impacts, the ratings appear to be completely qualitative.

- 2-53 Surface water - This summary of impacts on surface waters concludes the construction phase will have the largest negative impact (implying that increase sediment load is the worst impact). However, it can be argued that the markedly decreased flow (zero discharge) of the surface water control system will have larger impacts on senior downstream users and on the alluvial aquifer "reservoir".

- 2-59 Surface water - This discussion of the impacts of the water supply system includes an assertion that depletion due to well pumping might not be evident for years. Our data indicates that the depletions will be evident in only a few days.

- 2-69 Ground water - "The highest adverse impacts to ground water would be anticipated from the alluvial well system on Clear Creek mesa." Is this the canyon alluvial wells, the bedrock wells on the mesa, or a new group of wells? The discussion then asserts that the loss of recharge due to reservoirs on the mesa is a lesser impact. This loss of recharge will almost certainly reduce flows at the Getty gauge.

- 3-18 Water Quality - "During periods of low precipitation, streamflow may be entirely comprised of ground water spring discharge..."

- 3-23 Ground Water Occurrence - The authors find it "atypical" that the Ulnia is dry at the test sites; however, criteria refer p. 3-22 where they describe ground water conditions in the Ulnia as follows: "In many localities, the Ulnia has been deeply incised by streams and erosion. In these areas the Ulnia is well drained and essentially devoid of ground water".

Repetitively, the report describes the A and B sandstones. They are not, they are fractured reefs (beds of volcanic ash). The reefs are more brittle than the well shale horizons, resulting in more intense fracturing.

- 3-30 Surface of Ground Water Interaction - The authors assert that the ground and surface waters may be closely connected in Clear Creek. Also, they assert that pump test results show that flow is not affected by long term pumping. We have developed data which has pretty much conclusively shown that neither of these statements is correct.

Note that the discussion of the section are not consistent with Ulnia 4 and 8 of the last paragraph of p.4-43, where streamflow reductions are predicted.

- 4-52 Impacts of Shallow Aquifers - "Downstream impacts directly associated with the mine should be negligible for the alluvial springs of lower Clear Creek". True enough. However, upland water control schemes and zero discharge of surface waters could have a massive impact.

- 4-52 Ground Water Withdrawals for Facility Water Supply - Again, the alluvial wells may be used for the full life of the project.

"The major impact would be a decrease of the saturated thickness..." depends upon the point-of-view. The major impact is the decreased stream flow.

The drawdowns presented are correct for an infinitely confined aquifer. However, in a doubly bounded system such as this, drawdowns will be much larger. Using image theory and only a of the infinite number of image wells required in this problem, the drawdown of CO-ALL-17 is nearly 20 feet, instead of the 5 reported. This impact is being seriously under-estimated.

The authors have admit connection between ground and surface waters in lower Clear Creek (below Scott Gulch) but try to exclude middle and upper Clear Creek. There is no evidence to suggest that a separation exists above Scott Gulch. Ground Water pumping will also likely affect the spring just above the Newton ditch diversion.

- 4-70 Aquatic Ecology General Impacts - The second paragraph recognizes that stream flows will be reduced because of alluvial pumping and water storage reservoirs. Other statements to this effect are in paragraph 6, p. 6-70, paragraph 6, p. 6-72 and paragraph 6, p. 6-73.

- 4-168 Ground Water - Getty questions that the drawdown figures presented here are large enough.

We urge that you give serious consideration to the comments contained herein. If we can provide further information, please do not hesitate to contact us.

Sincerely,

Charles A. Zimmerman
Principal Minerals Engineer
CAZ:ah

The report then goes on to say that chemical data regarding this interaction are limited. However, the data presented in the document show the quantities of stream flow and alluvial ground water to be very similar.

- 4-36 General Impacts - "Withdrawals of groundwater could deplete streamflows of Basin Creek". Clear Creek needs to be added.

- 4-44 Wellfield System - 8 mesa (bedrock) wells will produce 800 acre ft/year. Each will produce 15gpm, which is possible.

"Impacts on surface stream flows would be negligible." This is not necessarily so. Moving water from the bedrock will cause discharge at the cliff face to subside and recharge to the alluvial aquifer. At steady state (achievable in the 30 year project life), the entire volume collected in the wells will be taken from this discharge. In part, this will be a good use of water which would otherwise be evaporating. However, some of the well water will diminish potential recharge to the alluvial aquifer. This lost recharge may be replaced during peak run-off events, so that no net reduction in recharge in water levels (and spring flow) occur, but this has not been shown.

The Basin Creek wells might be used for CDSW water supply, and not just augmentation.

The document (top of p.4-45) still does not recognize a connection between the Clear Creek alluvium and the surface streams.

- 4-45 Spent Shale Disposal - The discussion here overstates a concern that alluvial channel storage in the alluvial furrow beneath the fill would be reduced by the through-flowing diversion of Clear Creek. The authors figure a large storage figure based on the stream loss between a mine gauge and a canyon gauge.

Although it cannot be proven, now it would seem that most of the loss occurs in the canyon reach above the gauge, and that the loss is recharge to the canyon alluvial aquifer (not to a mesa alluvial aquifer). This means that the impact discussed in the document is non-existent. In addition, the diversion should not affect the quantity of recharge to the canyon alluvium unless the bypass and Sedimentation Reservoirs are lined. The diversion will probably result in worsened water quality.

- 4-52 Impact on Downstream Surface and Ground Water Interaction - Although the authors have recognized that interaction exists (refer unfavorable, however to p.4-45, 3-20, and favorably to 3-30), they say "Recharge to both streamflow and the alluvial aquifer could be altered and perhaps decreased, but it is not expected to substantially reduce surface or subsurface flow". The authors are discussing changes due to mining activities (which apparently includes the upland reservoirs). If the Bypass and Sediment Reservoirs are lined, there will likely be a decrease in alluvial water levels and Getty gauge flows.

CITIES SERVICE COMPANY
BOX 30
FALLS, OREGON 97112

May 2, 1983

Mr. Robert Kline
C.C.S.P. c/o Team Leader
Bureau of Land Management
754 Harrison Drive
Grand Junction, CO 81501

Dear Mr. Kline:

Cities Service Company wishes to offer comments on the Clear Creek Shale Oil Project Draft Environmental Impact Statement. Cities Service is a member of the GCC joint venture, as are Chevron, Shell Oil Company and Getty Oil Company. GCC is developing common facilities to allow each participant in the GCC to divert and reuse water. priority life water from the Colorado River under each participant's individual water rights.

The GCC facilities are an integral part of the CDSW/In-Basin Creek Water System, as the draft EIS clearly recognizes starting in Section 1-1. Each facilities will also be an integral part of Cities Service's oil shale project.

The official comments of the GCC joint venture will be sent to you by Cities Service. The co-ordinator of the GCC joint venture, Cities Service hereby endorses those comments but also wishes to offer its own comments.

As a member of GCC, Cities Service has also participated in the funding of several studies and work which appear to have been used as support documents for the EIS. All such documents are currently cited as originating from Chevron only. Cities Service must insist that citations to such documents indicate the joint origin of such documents both in the text citations and in Section 2.0 - References. Attached as Appendix A, Cities Service is a detailed list of the documents completed for the GCC and submitted to BLM. Acceptable forms for the references would be GCC, 1982 - or Chevron/GCC, 1982.

Major concerns of Cities Service are with Sections 4.1 Water Resources, 4.7 Aquatic Ecology, and Section 2.4 Comparison of Alternatives. Our analysis of these sections indicates other areas such as parts of Section 2.3 and others that require further clarification as well and are discussed below. Detailed comments on sections not highlighted in the main body of this letter are attached as Appendix B.

Cities concerns with Section 4.4 Water Resources are with sections 4.4.1 and 4.4.2 on surface and groundwater respectively. With regard to Section 4.4.1 Water Resources Surface Water, Cities supports the type of analysis found in Section 4.4.1.2 page 4-41 and 4-42 but wishes to supply clarification and request some minor corrections as follows.

14

The sum of the estimated annual net depletions for the three GOC member companies: Getty, Chevron and Cities should be 73,000 Acre-feet/year. The projections for allcity impacts for Chevron and for the sum of the estimated annual withdrawal should be adjusted accordingly on pg. 4-42 for all three companies.

To support and clarify the estimated annual withdrawal for the three GOC member companies Cities Service requests the insertion of an additional table which is presented below along with suggested language to be substituted into Section 2.3-2.4 page 31.

Water Development - Phase II

The second phase of the water development program would involve using of large volumes of water from the Colorado River. During this phase, commercial development would reach the 100,000 bbl level. The full scale Deque and full scale Loma system would be utilized to deliver this water.

Deque System. The Deque system would include all facilities which would divert, store, and deliver water from the Colorado River near Deque for use in connection with the CCSP. The GOC system would be a major component. Other facilities would include a pipeline/pumping plant system which would deliver water from the Roan Creek reservoir to the CCSP, Getty and Cities would install facilities to withdraw water from the reservoir.

Estimated water requirements for Chevron were listed in Table 2.3-7 but are repeated below along with those of Getty and Cities Service, the other GOC water project participants.

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Table 2.3-8(A) Estimated Water Requirements for 100,000-bbl Production Facilities for GOC Participants Including Chevron, Getty and Cities Service

Project Component	Estimated Water Requirements (Acre-ft./Day)		
	Chevron	Getty	Cities
Wiring	0	7	8
Watering	86	30	64
Upgrading	9	9	10
Domestic	23	22	16
Total	66	75	78

14

With regard to Section 4.4.2 Water Resources - Ground Water, Cities Service offers the following:

The discussion of the impacts on water resources has not taken into account that various Chevron water rights applications have engendered protests from other affected water users. Cities Service has itself filed protests in Case Nos. 80C646, 80C648 and 80C649 in the District Court for Water Division No. 3, State of Colorado. These protests generally allege that the granting of Chevron's applications for conditional underground water rights and its proposed Plan of augmentation may have injurious effects on the use of other water rights unless appropriate terms and limitations are imposed to prevent such adverse effects.

The failure to take into account the impact of water availability is easily demonstrated by reference to the discussion of the Wall Field System at Page 4-44. It is stated there that the four wells along Roan Creek would be used to augment the yield of the Clear Creek mesa wells and to protect the rights of downstream appropriators. At the same time, the discussion states that the alluvial aquifer appears to be in communication with the stream. In these circumstances, it appears unlikely that the applications affecting the Roan Creek wells would be granted as proposed. To the extent injury of Roan Creek and Colorado River appropriators, and the impact of the Roan Creek and other well systems is not otherwise accurately assessed.

With regard to Section 4.7/Aquatic Ecology, Cities Service believes that extensive changes and a complete rewrite are needed for this section. Some of Cities recommended specific changes to this section of the EIS are mentioned below. More extensive comments can be found in the GOC comments submitted by Getty as operator for the GOC. Cities Service as a GOC member wishes to reiterate its support for the GOC comments in general and those on Section 4.7 in particular:

Specific comments on Section 4.7 Aquatic Ecology

Page 4-69 Section 4.7.1 - General impacts first paragraph - As mentioned above Cities believes that a complete rewrite is needed for all of Section 4.7. Such a rewrite should remove the concern of this paragraph with the preliminary nature of the impact assessment. It is also Cities opinion that the information needed for this assessment is available and that no really significant additional information is needed.

Page 4-70 Section 4.7.1 - Paragraph beginning "The water supply system..." changes "would likely" to "may". Note: Postulated impairment losses are only correct if fish are present. Two feet per second is an adequate escape velocity for all adult fish.

Paragraph beginning "During bath construction..." This paragraph is at best speculative. It should be deleted or heavily caveated. Note estimate water requirements for all three GOC members as shown in table 2.3-8(A) includes allowances for domestic water supplies.

14

Page 4-7.1 Section 4.7.2 Reservoirs - Insert underlined phrase to read "A minimum size 175,000 acre - ft...". Also note that stream sampling work (DWRP/282) in testimony presented to the Colorado Water Quality Control Commission in October, 1985 by Getty Oil Company indicated that this habitat is not suitable for a cold water fishery. Thus no rainbow or cutthroat trout populations should be impacted because no population as such does or can exist in the reach.

Page 4-73 Section 4.7.2 Paragraph beginning "More significant impacts..." Contrary to what this paragraph states, river flows shown in Table 4.7-2 do reflect recent diversions. Note that average river flows given are lower than historical flows and thus reflect diversions.

More importantly the analysis in this paragraph should follow the same approach as that on pages 4-41 and 4-42. That is the impacts of the maximum water rights scenario as reflected in table 4.7.2, the combined effect of all three companies net depletions (175,000 acre ft/year), and the effect of CCSP's net depletions should be evaluated.

For clarity Cities Service requests that the following table be inserted after table 4.7-2 since it better reflects the net annual depletions on the Colorado River by GOC member companies. This table should be used as one basis for aquatic ecology impact analysis. It also supports the numbers discussed on pages 4-41 and 4-42 of the draft EIS and will thus provide clarification for that discussion.

Table 4.7-2a GCC-IV Monthly Net Depletions in Acre Feet

Months	GCC	Cities	Cheyron at Sebeque	Cheyron at Loma	GCC Total
January	1063	2217	1052	281	5393
February	1773	2001	962	276	4736
March	1053	2217	1112	308	8090
April	2127	2123	1162	483	5392
May	2455	1175	1172	405	5107
June	2743	2063	1293	761	6500
July	2079	2110	1384	870	6539
August	2060	2135	1094	763	6054
September	2346	2069	1161	654	5630
October	2136	2201	1382	688	5719
November	1869	2165	1052	332	5006
December	1853	2217	1052	334	5062
Annual Total	27390	29608	13673	6410	66903

Note: GCC-IV total depletion is reflected in column (5). It is the sum of columns 1 + 2 + 3.

Depletions calculated on the basis of 1964-1974 water year of record. Figures represent water necessary to support 100000 BPD production level for each GCC participant.

Page 4-73 Section 4.7.2 Paragraph beginning "the estimate of losses..." Reference cited as Cheyron 1976 does not support the conclusions about the weir.

Page 4-73 Section 4.8.2 Paragraphs beginning "However, some..." and "No features which..." contain several statements which Cities finds to be unsupportable.

First, no recent records of the Federally endangered Colorado Squawfish or humpback chub are known in the river reaches above, at or below the proposed GCC intake site.

Second, Cities Service professional specialists have examined the series of three diversion dams in the Colorado river including the Grand Valley Project Diversion Dam in 133, 1700, 2886, the abandoned but still intact Irrigation District Dam in 53, 1115, 1886 and the river training structure at the inlet of the Grand Valley Canal in 24, 171, 561 UTM. Each of these structures in themselves appears to Cities to be a barrier especially for upstream movement of fish. In addition to operation of these structures may further cause impediments to fish movement. Collectively they appear to completely rule out the possibility of having any population of humpback or humpback chub in the vicinity of the GCC intake.

Third, entrainment of any large number of nonteleost organisms is cold weather is not biologically credible. Reproduction of fish doesn't take place in winter. Reproductive products are thus not going to be entrained to slurry. February and March the months when GCC can theoretically withdraw the greatest proportion of the river under water rights. Parenthetically all withdrawals will be for plant end-of-reservoir filling needs. Also see Table 4.7.2a above.

Fourth, it is not accurate to state that no features which would help lessen impingement and entrainment losses have been incorporated into the Gabeque (GCC) diversion design. The King runs in the proposed intake structure will help deflect nonteleost organisms away from the intake.

No fish screen design can prevent some small organisms from being impinged or entrained. In fact evidence exists that small screen openings might cause a decrease in entrainment and an increase in impingement. Use of engineered porous dikes has not been shown to be practical or proven technology for the quantities of water needed by GCC and/or the suspended solids loadings found in the Colorado river. See Fritz, C.L. 1980. Cooling Water Intake Screening Devices Used to Reduce Instream and Impingement. Topical Inter: Fish and Wildlife Resources and Electric Power Generation, No. 3. Office of Biological Services (US) Fish and Wildlife Service, PWS-80-76/0-9. National Power Plant Team, Ann Arbor, Michigan for a discussion of the pros and cons of various screening devices.

Page 4-74 Section 4.7.2 Paragraph beginning "The machine water..." Delete the 4th sentence. GCC members have never suggested area return flow.

Page 4-76 Table 4.7.2. Foot note should read: Based on GCC river flow data and their analysis of water rights and the legally maximum divertible water (Cheyron 1976).

Page 4-76 Section 4.7-2A. Add table listed above to make analysis comparable to that in Section 4.4.1 page 4-41 and 4-42 as suitably corrected.

Page 4-75 Table 4.7-3 - Cities Service along with other GCC members does not agree with the flows listed in this table. Hydrological analysis indicates that these flows are not historically available. Cities believes that fisheries data in the Miller et al. 1982 reports are excellent. However, the hydrologic analysis does not support suggested hydrologic/hydrologic relationships as can be seen by a review of the report.

Cities Service would like to call attention to some of its concerns with Section 2.4 - Comparison of alternatives. Cities believes that this section is important because it is supposed to summarize and compare the impacts of various possible project configurations. Since it is a summary it should be state and emphasize that subsequent chapters 3 and 4 contain details on the base environmental conditions and environmental impacts respectively.

Specific comments Section 2.4 Comparison of Alternatives Page 2-40 Section 2.4.2 - Methodology - Paragraph beginning "It is important..." This is perhaps the most significant statement in the entire text - Cities Service strongly supports this paragraph.

Page 2-70 Section 2.4.6 - Aquatic Ecology - As discussed above Cities Service believes and requests that Section 4.7 Aquatic Ecology be totally rewritten. Since this section is a summary of 4.7 it will have to be totally rewritten as well. See extensive comments on Section 4.7 above for specific concerns.

Page 2-73 Section 2.4.7 - Wildlife - The statement on impact of the various reservoir sites does not appear to be supported by a study done for GCC and submitted to BLM (see Appendix 5).

Page 2-73 Section 2.4.7 - Vegetation - Impacts of revisions on threatened and endangered plant species will be a function of final reservoir size. See pp. 2-32 Paragraph beginning "For storage in Roan Creek..." and make the analysis based on that description.

Cities Service also disagrees with portions of Section 2.4.11 BLM's Preferred Alternative.

Page 3-85 Sentence beginning "Water diversion points..." a modified design for the Gabeque intake is not feasible. Also see comments on Section 4.7 above on this issue.

Page 3-86 Sentence reading "than Creek reservoir - the lower Dry Fork reservoir". Cities Service does not agree with this alternative based on engineering information available at this time.

Cities Service Company wishes to thank the BLM for the opportunity to comment on this draft EIS, and would appreciate Cities the opportunity of commenting on the Final EIS when it is issued for review.

Very truly yours,

Michael
J. Mulheisen
Manager
Project Development and
Synthesis Coordinator

Chicago:6666

cc: C. A. Zimmerman/City
M. J. Frank/City
G. E. Bishop/Cheyron
A. M. Hart/Cheyron
T. Chert/Chevron
R. Smith/Chevron

Chevron/GCC 1981b. Soils baseline report, GCC reservoir site and pipeline corridor. Denver, GCC prepared by ERI, Inc.

Chevron/GCC 1981f. Aquatic ecology baseline report, GCC reservoir site and pipeline corridor. Denver, GCC prepared by ERI, Inc.

Chevron/GCC 1981g. Vegetation baseline report, GCC reservoir site and pipeline corridor. GCC, Denver prepared by ERI, Inc.

Chevron/GCC 1981h. Cultural resources inventory, GCC reservoir site and pipeline corridor. Denver, GCC prepared by Laboratory of Public Archaeology (LOPA).

GCC/Chevron 1987b. Baseline description for the aquatic environment near Delhake. Denver, GCC prepared by NIS Corporation.

GCC/Chevron 1988a. Baseline description for the riparian environment of the Colorado River downstream from Delhake. Denver, GCC prepared by NIS Corporation.

Chevron/GCC 1988b. Results of threatened and endangered plant survey on GCC Reservoir alternatives. Denver, prepared by ERI, Inc.

GCC/Chevron 1988b. A cultural resources inventory for the GCC upper Dry Fork reservoir in San Ysidro, Siskiyou County. Denver, GCC prepared by Canadon Research, Inc.

Nancy 1981. Nancy B.C. Jr. 1981. Environmental evaluation of alternative intake schemes and sites. Denver, MO, final report prepared by NIS Corporation, Environmental Sciences Division for Water Supply project GCC Joint Venture.

Chevron/GCC 1981. Wildlife baseline report GCC reservoir site and pipeline corridor. Denver, GCC, prepared by ERI, Inc.

Page 2-69 Surface water - Paragraph beginning "Surface water impacts..." - This statement is misleading. The USFWS has not identified any critical areas that would be impacted in the Delhake intake area. In addition the USFWS conservation reports have not identified any threatened or endangered fish above the Grand Valley Project Diversion dam located above Pileata Creek, well below the Delhake intake.

Page 2-70 Aquatic Ecology, See comment above. Cities Service requests complete rewrite.

Page 2-71 Surface water Flood hazard is not a function of dam height, but rather of volume of water impounded.

Page 2-72 Geology Second sentence - Change the word restrict to prohibit or prevent. Generally, as is common in all earthen dam construction, the borrow areas and those which would be inundated. Consequently any geologic resource within this area would be used in dam construction.

Page 2-72 Table 2.4-4 - This should be footnoted with statement on 3rd paragraph 2.4.2 Methodology, p.2-49. See comments above also.

Page 2-73 Aquatic Ecology - Data submitted by Chevron and the GCC does not support this conclusion. Our baseline indicated aquatic biota is uniform throughout the San Ysidro area.

Page 2-83 Rail Transport - It appears that the planned rail corridors up San Ysidro are not consistent with any of the planned reservoir alternatives.

Page 2-85 BLM's Preferred Alternatives. See comments above.

Page 3-12 Water Supply: This is Lee Ferry, Arizona. Also note that allocated share for Colorado consumption should be 2,400-2,500 acre-feet.

Page 3-12 Water Use: Fourth sentence...stream flows have been substantially altered. Question: altered from what? Does this refer to present/past independent periods?

Page 3-14 Ross Creek Drainage, third sentence should read: Ross Creek flows southeast through a U-shaped valley with valley floor widths ranging from 0 to 100 feet of the plateau and from 500 to 1500 feet in the valley bottom.

Page 3-19 Ross Creek Drainage - Reference should be to (CDOH 1983).

Page XVII

Description - second sentence should read: "The major components of the project would consist of an underground and open pit mine; retreating and upgrading of shaft pit, spent shale disposal in upper Clear Creek canyon Creek..."

Page XIX

Analysis and conclusion: Colorado River diversion projects - No basis for this statement. See (CDOH 83, p. 3-19). Analysis and conclusion: Ross Creek reservoirs - BLM/CNH selection process is not based upon dam safety, engineering, or environmental review of the proposed dam sites. It is apparently based solely upon impact on threatened and endangered plants. This is not acceptable to Cities Service.

Page 1-4 Section 1.2 CIS Regulatory Actions - Cities Service Company supports this section.

Figures 2.3-1 to 2.3-4 - All figures show the wrong point of GCC diversion. Should be located below Delhake.

Figure 2-30 - Wall System - See Cities comments on 4.4 - Groundwater.

Page 2-31 - See Cities comments on 2.3 above.

Page 2-31 - Delhake System: Paragraph beginning "The Initial GCC..." - Second sentence should read: Figure 2.3-1 shows approximate location of intake sites being considered.

Page 2-32 - Paragraph beginning "Water Storage (...)" - Fourth sentence: Depending on future needs, the total reservoir capacity, including dead storage could be as much as 175,000 acre feet. The proposed reservoir is located at the Upper Dry Fork site shown in Figure 2.3-1.

Page 2-33 - Alternative water system, Paragraph beginning "Another alternative..." - Second sentence - need additional clarification of the "here or there" issue.

Page 2-52 - Table 2.4-1 - This table should be footnoted with 3rd paragraph 2.4.2 Methodology, page 2.49.

Page 2-54 Geology, Paragraph beginning "Cumulative use of..." - Geologic resources, sand/gravel/earth materials would be used in the construction of the proposed surface canal construction.

Page 2-55 Aquatic Ecology - Paragraph beginning "All of alternative..." - First sentence, within parentheses, should read "which may result from operation of the Delhake and Loma intake structures. Note postulated impacts are not limited to the Loma intake.

Page 3-36 Paragraph beginning "Four alternative reservoirs..." - Note that the alluvial deposits are thicker in the Carr Creek reservoir alternative. Geotechnical investigations show that all sites are somewhat different.

Page 3-36 Paleontology, third and fourth paragraphs: Question, is the TNU 1981 reference limited to the US Novel DIT Shale reservoir? If so why is this referenced here?

Page 3-61 Paragraph beginning "The Colorado River is the major river..." - Second sentence add: "Only eight of which are active fishes, with the remainder being introduced in the last 100 years."

Page 3-61 Paragraph beginning "Physical habitats of..." - Note Miller et al 1982 Part III (Fishes) report suggests that water quality is not limiting the threatened and endangered fish. However, predation by non-native fish may be impacting the populations.

Page 3-62 Table 3.7-1, Note Carr Creek, Threatened and Endangered fish present should read "yes".

Page 3-63 Table 3.7-2 Note: Historic and Present Status columns are reversed.

Page 3-63 Terrestrial ecology, fourth paragraph: why is Graham, 1957 reference cited? Terwilliger et al 1974 is much more up to date and complete.

Page 3-48 Table 3.8 - Note: Sagebrush Shrublands do not support Prairie Rationals; they may support the Western Hellbender, *Crotalus viridis* and the Great Basin Gopher Snake, *Pituophis* sp. deserticola.

Page 3-51 Threatened and endangered species. Plants. Paragraph beginning "Rare or endemic..." seventh sentence. The USFWS has no regulatory authority to regulate non-endangered or candidate plant species. The 1983 citation is not included within the bibliography. The USFWS should substantiate its authority by explicit citation of this reference should be deleted.

Page 3-52 Paragraph beginning "Merganser falcons..." - Note Craig et al contradictory comments: how can habitat be essential if the species is not present?

Page 3-53 Sensitive Habitat, Paragraph beginning "The historic range..." - why select sensitive habitats? How were sensitive habitats for elk and mule deer defined within areas? Note: The so-called sensitive habitats have no regulatory status.

Page 3-54 Figure 3.8-1, Source (BLM 1980a) not in references - Provide reference or delete entire page.

Page 3-54 Figure 3.8-1, GCC Point of Diversion incorrectly shown.

Page 3-55 Figure 3.8-2, GCC Point of Diversion incorrectly shown.

14

14

Page 3-56 Clear Creek Mesa and Associated Siting Activities, Paragraph beginning "Chevron (1982b)". Cited reference does not discuss all the species discussed within this paragraph.

Page 3-57 Paragraph beginning "R1 distribution..." Note that the extent of defined critical range is questionable. It appears that too much information was incorporated by reference in the upper Near Valley (see Chevron 1982a).

Page 3-62 Clear Creek Mesa and Associated Siting Activities, First paragraph, last sentence, Note: Centaurus Research of Montrose, Colorado, conducted cultural resource field surveys of the Dry Fork Reservoir sites for GOC.

Page 3-66 Clear Creek Mesa and Associated Siting Activities, First paragraph, Note: Nearly all of the lands impacted by the proposed reservoir alternatives located in Near Valley are located on privately owned lands. Note: Disagree with the definition of Prime Farm Lands; Near Valley properties are meadows and hay pastures, generally used to support livestock grazing.

Page 3-106 Table 3.13-1, Table corrections: Shoshone 14000 kw, Lower Nellie = 4800 kw, Upper Nellie = 9600 kw.

Page 4-26 Figure 4.3-1 Railroad suggests alternative does not consider any of the reservoir siting alternatives. Note: Railroads are located in middle of valley floor.

Page 4-33 Paragraph beginning "Major surface waters..." Third sentence should read: Water storage reservoirs may pose potential hazards to downstream communities in the unlikely event of failure.

Paragraph beginning "Spent shale disposal..." Note that all reservoirs tend to attenuate peak runoff events by storage and controlled releases.

Page 4-37 Figure 4.4-2 Lower Clear Creek dam site incorrectly sited.

Page 4-39 Figure 4.4-2 Oglethorpe reference to pipeline sizes in the figures.

Page 4-40 Upper Dry Fork Reservoir, conform language on alternate storage to pp. 2-30.

Page 4-41 See comments in major body of letter.

Page 4-43 First three paragraphs on page. Under the federal safety of dam program the Colorado State Engineer's Office will require specific construction and operational requirements to insure dam safety and integrity.

Page 4-47 Reservoirs, third sentence: Note: Upper Dry Fork is not an alternative, but rather the proposed site.

Page 4-61 Reservoirs, first sentence: Note the total embankment height is proposed at 225 feet.

Page 4-65 Paragraphs starting "One important fossil..." and "Another fossil locality..." Identify the locations and delete the references. Not possible to see if any impact on the basis of this information.

Page 4-67 Table 4.6-1 Note Reservoir alternatives indicate no prime farm lands, inconsistent with citation on page 3-66.

Page 4-69 Aquatic Ecology, see detailed comments in main body of text.

Page 4-80 Table 4.8-5 Kinball Creek Reservoir dropped from review.

Page 4-92 Wildlife: Citation is incomplete in bibliography. Correct or delete.

Page 4-133 Table 4.13-1 does not include 20 Mw/inst power requirement for the GOC water project.

Page 4-167 Aquatic Ecology, second sentence. Assumption is not supported.

Page 4-168 Paragraph beginning "Cumulative impacts..." this paragraph is not associated with the proposed project.

Page 4-170 Unavoidable Adverse Impacts, item four should be 24,000 AF for Clemon = 73,000 acre feet total for all three GOC embanks.

Page 4-174 Aquatic Ecology, this whole section should be revised after 4.7 reviews. In releases from the Reservoir are planned, however, when the GOC participants are out of priority diversion from the Colorado River would not occur.

Paragraph beginning "Direct impacts to..." What design modifications? If this implies infiltration, this was considered, analyzed and rejected by the engineering contractor. Note: Citation is incorrect.

Page 4-175 Paragraph beginning "Addition of..." Traveling screens were considered, analyzed, and rejected by the engineering contractor as unacceptable for this reach of the Colorado River. Also note that the USFWS reports do not indicate that threatened and endangered fish species are found above Camero.

15

15

Getty

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Memorandum Distribution

April 27, 1983

TO: Mr. Robert Kline, Team Leader
Bureau of Land Management
Grand Junction District
764 Horizon Dr.
Grand Junction, CO 81501

FROM: Mr. Carlos A. Zimmerman
Getty Oil Company
Operator, GOC Joint Venture
2810 Wilshire Blvd.
Los Angeles, CA 90010

SUBJECT: Review of Draft Environmental Impact Statement - Chevron Clear Creek Project.

Dear Mr. Kline:

We have reviewed the subject draft and find that in general it adequately describes existing conditions and likely impacts to occur with the construction and operation of the proposed project.

We wish to state as the outset that our comments are limited to those of the GOC Joint Venture. The Joint Venture was formed because it is the policy of the State of Colorado, as indicated by its statutes, to encourage joint facilities for the conveyance of water and to minimize the number of structures which are used for the conveyance of water on improved or occupied lands. In addition, such joint facilities for water would be more efficient, economical and would in turn minimize the environmental impacts.

As you will recall the GOC Joint Venture proposed to construct a diversion structure on the Colorado River, a reservoir near the confluence of Dry Fork and Near Creek, and a pipeline system from the Colorado River to the Reservoir for use by all three companies.

Getty, Cities Service, and Chevron find it essential to clarify the future handling of this water development project because of the substantial investment which will be required, as well as our current involvement within this impact analysis. Because of this the GOC Joint Venture urges that you give serious consideration to the attached comments and recommendations. Specifically the GOC wishes to highlight the following major items:

Section 2.3.2.4, Page 2-31, Water Development Plan:
Note the attached Table 2.3-8(A) which includes estimated

water requirements for 100,000 BPD production facilities

Section 2.4.2, Methodology:

The GOC strongly supports this statement, noting that subjective numerical ratings are at best a function of professional judgment.

Section 4.4.1.2, Page 4-41, Upper Dry Fork Reservoir:

Note the revised total GOC depletion figure.

Section 4.4.1.2, Page 4-42 Salinity:

The GOC strongly supports this type analysis.

Section 4.7 Aquatic Ecology:

The GOC believes that the US Fish and Wildlife Service (USFWS) presently has enough information within its current Colorado River Fisheries Reports to address general impacts over this entire section. Per these reports the USFWS clearly indicates that the species of concern are not presently found above the restrictive series of dams between Fallside and Camero; far below our proposed point of diversion.

As operator of the GOC-JV it is important to note that the GOC-W conducted extensive field studies within Near Valley and the surrounding area and produced reports to support our proposals. These reports listed on the attached sheet, were misrepresented as being solely supplied by Chevron.

Overall the subject documents is well written and provides the reader an appreciation of the major impacts likely to occur with the construction and operation of the proposed project. Thank you for providing us as opportunity to review and comment on this draft. If we can provide further information, please do not hesitate to contact me.

Sincerely,

Carlos A. Zimmerman
C.A. Zimmerman
Getty Oil Company

CAZ:ah

GCC BASELINE DATA REPORTS

1. 1981 Soils baseline report, GCC reservoir site and pipeline corridor. Denver, Chevron, prepared by ERT, Inc.
2. 1981 Aquatic biology baseline report, GCC reservoir site and pipeline corridor. Denver, Chevron, prepared by ERT.
3. 1981 Vegetation baseline report, GCC reservoir site and pipeline corridor. Denver, Chevron, prepared by ERT.
4. 1981 Cultural resources inventory, GCC reservoir site and pipeline corridor. Denver, Chevron, prepared by Laboratory of Public Archaeology (LPA).
5. 1981 Environmental evaluation of alternative intake schemes and sites. Denver, Chevron, prepared by NGS Corporation.
6. 1981 Baseline description of the aquatic environment near Deleque, final report. Denver, Chevron, prepared by NGS Corporation.
7. 1982 Baseline description for the riparian environment of the Colorado River downstream from Deleque. Denver, Chevron, prepared by NGS.
8. 1982 Results of threatened and endangered plant survey on GCC Reservoir alternatives. Denver, Chevron, prepared by ERT.
9. 1982 A cultural resources inventory for the GCC upper Dry Fork reservoir in San Juan County, Garfield County. Denver, Chevron, prepared by Gintana Research, Inc.
10. 1982 Stream classification of Roan Creek. Prepared by Engineering Science.
11. 1982 Stream classification of Clear Creek. Prepared by Engineering Science.
12. 1982 March 8-9, 1981, Environmental evaluation of alternative intake schemes and sites. Denver, NGS, final report prepared by NGS Corporation, Environmental Sciences Division for Water Supply project GCC Joint venture.

page 1

- 2-3 Second paragraph, second sentence: change Roan Creek Reservoir to Dry Fork Reservoir on Roan Creek.
- 2-31 Water-Development Plan - Phase II, change last sentence to read: The full scale Deleque and Lom systems would be utilized to deliver this water.
- 2-31 Deleque System: Drop the last sentence of the first paragraph as this has not yet been clarified.
- 2-31 Deleque System: Fourth paragraph, second sentence should read: Figure 2.3-1 shows approximate location of intake sites being considered.
- 2-31 The following change is suggested: The following information is submitted to support the type of suitably corrected analysis found in section 4.3.1.2 pages 4-40 and 4-42. Changes proposed on this section and those proposed on section 4.3.1.2 should be reviewed concurrently.

Estimated water requirements for Chevron were listed in Table 2.3-1 but are repeated below along with those of Getty and Cities Services, the other GCC water project participants.

Table 2.3-9(a) Estimated water requirements for 100,000 BPD production facilities for GCC participants, including Chevron, Getty, and Cities Services.

Project Component	Estimated Water Requirement (Acres-Ft/Day)		
	Chevron	Getty	Cities
Mining	8	7	8
Refining	28	30	44
Upgrading	9	9	10
Domestic	23	30	28
Total	68	75	78
			275

- 2-32 First paragraph, fourth sentence: Depending on future needs, the total reservoir capacity, including dead storage could be as much as 17000 Acres Feet. The proposed reservoir is located at the Upper Dry Fork site shown in Figure 2.3-1.
- 2-38 Last paragraph, water supply and control, last sentence should read "These sites referred to as Lower Dry Fork, Upper Cam Creek, and Lower Cam Creek, would have similar characteristics to the Upper Dry Fork site."
- 2-39 Alternative water system, second paragraph, second sentence - need additional clarification of the "Term at or near".
- 2-49 Methodology, third paragraph - This is perhaps the most significant statement in the entire text - The GCC strongly supports this paragraph.
- 2-52 Table 2.4-1. This table should be footnoted with third paragraph 2.4.1 Methodology, page 2.49.

CHEVRON CLEAR CREEK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Page: GCC/JV Comments by page:

- 11 Abstract, second sentence should read: "The project includes a combination underground/pit mine, rebar and upgrading facilities, a water system, two OGCC storage reservoirs..."
 - xvii Description, second sentence should read: "The major components of the project would consist of an underground and open pit mine; rebar and upgrading of shaft pit, spent shale disposal in upper Clear Creek canyon and in the open pit, a OGCC Joint Venture storage reservoir in Roan Creek..."
 - xix Analysis and conclusion: Colorado River diversion points - no basis for this statement see ESRAT #3, P. 2-70
Analysis and conclusion: Roan Creek reservoirs - OGCC selection process is not based upon dam safety, engineering, or geotechnical review of the proposed dam project. Apparently based solely upon impact on threatened and endangered plants.
 - 1-2 Second paragraph-first sentence: "The operator's proposed development activities include: (1) a combination underground/surface mine; (2) rebar and upgrading facilities; (3) a water system consisting of intake structures..."
General comment: This paragraph outlines the Chevron/GCC proposed activities and is most accurate...
 - 1-4 Section 1.2 EIS Regulatory Actions - The GCC/JV supports this section.
 - 1-5 First Sentence: Note: Fish and Wildlife Coordination Act of 1970, revised 1990
 - 1-5 Division of Water Resources: Should read...water will permit approval of plans and specifications for all dams that are in excess of 10 feet in height and have a water surface area at the high water level in excess of 20 acres, or have a capacity greater than 1000 A/F.
- Figures 2.3-1 to 2.3-4. All figures show the wrong point of GCC diversion. Should be located below Deleque.

page 2

- 2-54 Geology, second paragraph - Geologic resources, sand/gravel/earth materials would be used in the construction of the proposed earthen zoned dam embankment.
- 2-55 Aquatic Ecology - See attached report - "Assessment of the Impacts of the GCC Diversion - Intake System on the Aquatic Environment of the Colorado River", June 4th, 1983.
- 2-56 Third paragraph - Note that impacts on threatened or endangered plants is the same for all Roan Creek Reservoir alternatives.
- 2-59 Surface water, second paragraph: This statement is misleading. The DWR has not identified any critical areas that would be impacted in the Deleque intake area. In addition the DWR conservation reports have not identified any threatened or endangered fish above the government dam at Gams, well below the Deleque intake.
- 2-70 Aquatic Ecology, second paragraph - This impact analysis is too simplistic. The Godsey model which was used assumes that the fish are uniformly distributed throughout the river area, it also assumes they are present throughout the year. Neither is true at the Deleque intake area. First, there is no evidence of threatened or endangered fish in the area. Second, why are fishes swimming quality required in the winter? Third, the planned 275 velocity is more than adequate for fish escape velocities at an intake. Fourth, the 325 water withdrawal is a maximum, this percentage is lower during the critical low flow periods. It is a function of water rights.
- Third paragraph - First sentence should read: The proposed intake at Lom is of an environmentally preferred design. However, engineering has shown that a similar infiltration system is not practical at the Deleque intake location.
- 2-71 Surface water: Flood hazard is not a function of dam height, but rather volume of water impounded.
- 2-71 Geology: second sentence: change the word restrict to prohibit or prevent. Generally, as is common in all earthen dam construction, the borrow areas are those which would be inundated. Consequently any geologic resource within this area would be used in dam construction.
- 2-72 Table 2.4-8. This table should be footnoted with statement on 3rd paragraph 2.4.2 Methodology, p. 2.49.
- 2-73 Aquatic Ecology - Data submitted by Chevron and the GCC does not support this conclusion. Our baseline indicated negative biota is uniform throughout the Roan Valley area.
- 2-73 Wildlife: This is not consistent with the ERT baseline data on wildlife, submitted by the GCC.
- 2-83 Rail Transport - It appears that the planned rail corridors up Roan Valley are not consistent with any of the planned reservoir alternatives.

- 2-85 **QJM's Preferred Alternatives, Item:** Water diversion permits: Note that engineering has shown that a similar irrigation system is not practical at the Deque intake location.
- 3-12 **Water Supply:** Note it is Las Vegas, Arizona. Also note that allocated share for Colorado consumption should be 2,499,750 acre-feet.
- 3-12 **Water Use, fourth sentence:** Stream flows have been substantially altered. Question: Altered from what? Does this refer to present/past instantaneous periods?
- 3-14 **Ran Creek Drainage, third sentence should read:** Ran Creek flow discharges through a U-shaped valley with valley floor widths ranging from 25 to 100 feet on the plateau and from 900 to 1500 feet in the alluvial bottom.
- 2-15 **Stream flows, third paragraph, third sentence should read:** The annual yield of these drainages ranges from 122 acre-feet for Rio Hondo Creek to 16,474 acre feet at CJ 23 gauge for Clear Creek.
- 3-17 **Table 3.4-3, Note from C1-23 is shown on figures 3.4-1 to 3.4-23.**
- 3-19 **Ran Creek Drainage - Reference should be:** (COON 1993 update).
- 3-26 **First paragraph:** Note that the alluvial deposits are thicker in the San Creek reservoir alternative. Geotechnical investigations show that all sites are somewhat different. Note: No description is given for the Parachute Creek proposed reservoir or dam.
- 3-26 **Palaeontology, paragraphs four & five:** Question, Is the TW 1801 reference linked to the US Naval Oil Shale reserves? If so why is this referenced here?
- 3-41 **Third paragraph:** Note Miller et al. 1982 (Part III Fisheries reports) suggests that water quality is not limiting the threatened and endangered fish. However, predation by non-native fish may be impacting the populations.
- 3-41 **Seventh paragraph, first citation is incorrect,** should read (Kil 1977/Wick 1975).
- 3-42 **Table 3.7-1, Note Carr Creek, Threatened and Endangered fish present should read yes?**
- 3-42 **Table 3.7-1, Note:** In a 1982 fish sampling program of the West Fork of Parachute Creek no endangered or endangered subspecies were found.
- 3-43 **First paragraph, third sentence, Note:** In a 1982 fish sampling program of West Fork of Parachute Creek, no endangered or endangered subspecies were found (COON 1993 update).
- 3-43 **Table 3.7-2 Note:** Historic and Present Status columns are reversed.
- 3-45 **Terrestrial ecology, fourth paragraph:** Why is Graham, 1937 reference cited, the TW11471 is cited, such work up to date and complete?

- 4-27 **Figure 4.4-1 Lower Cone Creek dam site incorrectly sited.**
- 4-29 **Figure 4.4-2 Delete reference to pipeline sizes in the figure.**
- 4-40 **Upper Dry Fork Reservoir, third sentence should read:** The reservoir could be built under a plan of stepped construction.
- 4-41 **Add:** Storage capacity would be required because Cheyenne's Colorado River rights are relatively junior and may not allow water to be diverted continuously. The proposed CCC Dam Creek Reservoir would provide carryover storage for times when Cheyenne's water rights over Deque are out of priority or when the flow in the Colorado River near Deque is inadequate to fully meet the CCCD's needs. Cities and Getty would use their respective capacities in the reservoir to regulate their supplies in a manner similar to Cheyenne. See Table 2.3-9 for description of water rights.
- 4-42 **Clarify second paragraph, is this analysis additive 24000 + 72000 + 96000 or a total of 72000 AFT?**
- 4-43 **Paragraphs two, three, four:** Note: Under the federal safety of dam program the Colorado State Engineers Office will require specific construction and operational requirements to insure dam safety and integrity.
- 4-47 **Reservoirs, third sentence:** Note: Upper Dry Fork is not an alternative, but rather the proposed site.
- 4-61 **Reservoirs, first sentence:** Note the total embankment height is proposed at 225 feet.
- 4-62 **General Aspects, fourth paragraph:** Support this statement.
- 4-63 **Paragraph four, five:** Note identify the locations or delete the reference.
- 4-67 **Table 4.6-1 Note Reservoir alternatives indicate no prime farm lands, inconsistent with siting on page 3-66.**
- 4-69 **Aquatic Ecology first paragraph:** Leave the first sentence, delete the remainder of the paragraph.
- Second paragraph:** change dependence to dependent.
- 4-70 **Second paragraph:** change "would like" to "may". Note: this paragraph is full of wishy washy statements, consequently 2 fps is adequate excess velocity for all adult fish.
- Fourth paragraph:** delete: This paragraph is speculative and generic.
- Fifth paragraph:** believe that the USFWS wants analysis to river mile = 3.

- 3-49 **Table 3.8-note:** Sagehen Swallowtail do not support Prairie Restoration; they may support the western Battlemaster, Crowsfoot, and the Great Basin Gopher Snake, *Pituophis m. deserticola*.
- 3-51 **Threatened and endangered species, plants, second paragraph:** Seventh sentence. The USFWS has no regulatory authority to regulate non-endangered or candidate plant species. The 1992 citation is not included within the bibliography. The USFWS should substantiate their authority or delete this reference.
- 3-53 **Sensitive habitat, first paragraph:** Note: Who selects sensitive habitat? How were sensitive habitats for elk and mule deer derived within our nearest Note: The at present sensitive habitats have no regulatory status at present.
- 3-54 **Figure 3.6-1, Source (LHM 1980a) is not referenced in the document.**
- 3-54 **Figure 3.8-1 GOC Point of Diversion incorrectly shown.**
- 3-56 **Figure 3.8-2 GOC Point of Diversion incorrectly shown.**
- 3-56 **Clear Creek Mesa and Associated Siting Activities, second paragraph:** Note (Chevron 1983b) cited reference does not discuss all the species discussed within this paragraph.
- 3-57 **Second paragraph:** Note that the extent of defined critical range is questionable. It appears that too much information was incorporated by reference in the upper Ran Creek Valley - see (Chevron 1983a).
- 3-62 **Clear Creek Mesa and Associated Siting Activities, First paragraph:** First sentence, Note the Centuries Reserve of Montrose, Colorado, conducted cultural resource field surveys of the Dry Fork Reservoir sites.
- 3-66 **Clear Creek Mesa and Associated Siting Activities, first paragraph:** Note: Nearly all of the land occupied by the proposed reservoir alternatives located in Ran Valley are located on privately owned lands. Note: Disappears with the definition of Prime Farm Lands: Ran Valley properties are wooded and by owners, generally used to support livestock grazing.
- 3-69 **First paragraph, last sentence:** Delete sentence.
- 3-108 **Table 3.13-1:** Table corrections Shoshone 1400 kw, Lower Moline - 4800 kw, Upper Moline - 8400 kw.
- 4-26 **Figure 4.3-1:** Tailrace segments alternative does not consider any of the reservoir siting alternatives. Note: Reflows located in middle of valley floor.
- 4-26 **First paragraph, third sentence should read:** Water storage reservoir may pose potential hazards to down stream communities in the unlikely event of failure.
- Second paragraph:** Note the reservoirs tend to attenuate the peak runoff events by storage and controlled releases.

- 4-71 **Reservoirs, first paragraph:** Last two sentences, Getty 1982 stream survey work in Ran Valley indicated that this habitat is not suitable for a cold water fishery.
- Second paragraph:** Note that water quality characteristics down stream are generally improved by the placement of a reservoir. Note: That anoxic conditions have not been identified in Western Colorado to date.
- Third paragraph:** delete 15crs and add: "at rate to satisfy".
- 4-72 **Second paragraph, delete second sentence.** The remainder of the paragraph does not support this statement.
- 4-73 **Second paragraph:** last sentence: delete, analysis does not support these percentages.
- Third paragraph:** Colorado River Fisheries Reports by the USFWS indicate no species of concern located above Canon; consequently this analysis is incorrect and should be deleted.
- 4-73 **Fifth paragraph:** Note (Chevron 1983a) reference is incorrect. Note: The Reservoir is a status species which should be addressed in the context of their present status. Note: The USFWS, threatened and endangered species list. Note: The USFWS present reports clearly indicate that the species of concern are not presently found above the restrictive series of dams between Fallside and Canon; far below the proposed Deque diversion point.
- 4-73 **Second paragraph, delete fourth sentence, the GOC never suggested zero return flows.**
- 4-74 **Table 4.7-2, foot note should read:** Based on GOC River flow data and the analysis of water rights and the legally maximum divertible water (Chevron 1983a).
- 4-74 **Pg. 4-74 Insert this table below Table 4.7-2, as it better reflects the GOC-VI dam depletion on the Colorado River.**

Table 4.7-2a GOC-VI Monthly Net Depletions in Acre feet

Month	GOC	Cities	Chevron's Low	GOC	Cities	Chevron's Low	GOC	Cities
January	1881	2217	1052	281	3710	1710	4710	4710
February	1771	2201	962	271	3610	1610	4610	4610
March	1861	2217	1112	281	3710	1710	4710	4710
April	2127	2127	1142	483	5232	2127	5232	5232
May	2552	2170	1712	683	5787	2552	5787	5787
June	2743	2063	1293	761	6099	2743	6099	6099
July	3019	2110	1342	820	6371	3019	6371	6371
August	2840	2120	1599	763	6074	2840	6074	6074
September	2390	2145	1441	645	5670	2390	5670	5670
October	2136	2201	1382	578	5718	2136	5718	5718
November	1891	2145	1552	232	5716	1891	5716	5716
December	1863	2217	1062	232	5716	1863	5716	5716
Annual Total	2732	26937	13872	6142	59901	2732	59901	59901

NOTE: GOC-VI total depletion is reflected to column (5), it is the sum of columns 1 + 2 + 3.

Depletions calculated on the basis of 1956-1976 water year of record. Figures represent water necessary to support 100,000 BPD production level for each GOC participant.

- 4-75 Table 4.7-3 - Note this table does not suggest GCC occurred flow. Analysis indicated that these flows are not historically available. Note: The flows in the table are not the same as those reported are excellent. However, hydrologic analysis is not supported by biologic/hydrologic relationships.
- 4-90 Table 4.8-5 Kiesel Creek Reservoir dropped from review.
- 4-92 Wildlife: Citation is incomplete.
- 4-153 Table 4.13-1 Does not include 20 megawatt power requirement for the GCC water project.
- 4-166 Surface water, First paragraph: 25000 AF is incorrect, should read 24000 AF.
- 4-187 Aquatic Ecology, second sentence. This assumes a negative operation of the GCC diversion.
- 4-188 Second paragraph, delete, this paragraph is not associated with the proposed project.
- 4-170 Unavoidable Adverse Impacts, item four should be 24000 AF not 25000 AF.
- 4-174 Aquatic Ecology, third paragraph, no releases from the Reservoir are planned, however, when the GCC participants are out of priority we would not divert from the Colorado River.
Fourth Paragraph: What design modifications, if this implies fertilization, this was considered, analyzed and rejected by the engineering contractor, note: Citation is incorrect.
- 4-175 First paragraph: travelling screens were considered, analyzed, and rejected by the engineering contractor as unacceptable for this reach of the Colorado River.

Also note that the USFWS reports do not indicate species of concern are found above Canon.

GAZ:eh



Chevron Shale Oil Company

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D. Earl Hunt
Manager

May 3, 1983

**CLEAR CREEK SHALE OIL PROJECT
COMMENTS ON DRAFT ENVIRONMENTAL
IMPACT STATEMENT**

Mr. Dave Jones, Director
Bureau of Land Management
764 Horizon Drive
Grand Junction, Colorado 81501

Dear Mr. Jones:

The Draft Environmental Impact Statement on the Clear Creek Shale Oil Project represents a highly professional effort by the BLM and cooperating agencies involved in its preparation. To many in government and industry the DES contributes a state-of-the-art approach to EIS preparation that is reflected in its high quality.

Attached are Chevron Shale Oil Company's and Conoco Shale Oil Company's comments on the Draft Environmental Impact Statement. They are offered in the spirit of improving and strengthening the analysis and conclusions presented in the DES.

Our comments are presented in two parts. First, we offer a number of general comments about key aspects of the DES. Second, we offer a number of more specific comments on particular sections of the document.

We trust you will consider these comments in preparing the Final Environmental Impact Statement. Thank you for your consideration of our comments.

Very truly yours,

DEH:ip

Attachments

A-38

RECEIVED
MAY 3 1983
BUREAU OF LAND MANAGEMENT
U.S. DEPARTMENT OF THE INTERIOR

**GENERAL COMMENTS
DRAFT ENVIRONMENTAL IMPACT STATEMENT
CLEAR CREEK SHALE OIL PROJECT**

I. INTRODUCTION

The Clear Creek Shale Oil Project is an enormously complex undertaking requiring preparation of extensive engineering planning documents and environmental studies. In accordance with the intent of the CEG regulations (40 C.F.R. 150.11), the wishes of BLM, and the stated policies of the Colorado Joint Review Process (CJRP), Chevron engaged the NEPA process and the CJRP early in project planning (mid-1981) in order to permit thorough review and participation by all responsible federal, state and local agencies and thereby ensure that all necessary data and analysis would be collected and included in the EIS process. It was agreed by BLM and the CJRP that commencing NEPA review early in project planning would ensure thorough project review.

Over the past year and a half, we have submitted massive amounts of environmental baseline data, descriptions of various project alternatives, detailed responses to agency requests for additional information, descriptions of project components, and other documentation to BLM and other federal, state and local agencies. For example, over 160 individual project alternatives have been identified and considered in the Draft Environmental Impact Statement. All of these project alternatives were selected by the BLM as alternatives requiring detailed study in the document. Chevron Shale believes that this massive body of data, description and analysis complies with the letter and spirit of NEPA and is fully adequate to support the Clear Creek EIS.

II. SUMMARY

The summary on pages xvii through xix is difficult for the reader to follow. We believe this section could be improved by providing a map defining terms such as Label/Farfetch Creek route, the Fruita SOPS route, the Mesa collection system, the Lower Dry Fork site, the Mesa Valley fill site, etc., and referencing these components to the map. We suggest the FSI reflect these and the following changes:

1. The statement is made that "Adverse impacts have been identified on all project components during project construction; the most significant would be impacts to surface water, recreation, transportation, vegetation, soils, and wildlife." In view of the fact that the BLM has determined that impacts on socioeconomic factors are weighed heavily,

even during project construction, this impact is among the more significant.

2. Also under the analysis and conclusions for the proposed action, the following sentence should be added to the third paragraph: "Most socioeconomic impacts are beneficial, particularly in comparison to the No Action Alternative."

3. The Fruita II alternative is a 30,000 barrel per day alternative and should be moved under that heading.

III. ALTERNATIVES

A. CHAPTER 2, SECTION 2.2 AND APPENDIX A

1. Table 2.2-1 displays a vast array of alternatives and demonstrates substantial consideration to the economic, technical, and engineering strengths and weaknesses of each alternative. The Table identifies those alternatives that the BLM considered to be reasonable and feasible alternatives requiring detailed study in the DES and those alternatives the BLM eliminated from detailed study because they were deemed to be infeasible or impractical. Brief conclusions derived from Appendix A are presented to support elimination or inclusion.

In Appendix A, solid economic, engineering and technical reasons are given for the impracticability or infeasibility of all alternatives. However, in many instances the explanation does not clearly state conclusions derived from these reasons. Discussions in Appendix A should be modified to ensure that clear conclusions for impracticability and infeasibility on economic, technical and engineering grounds are presented. Table 2.2-1 should be checked to ensure that brief conclusions presented there are consistent with Appendix A.

2. In Table 2.2-1 and Appendix A, the BLM provides convincing economic, engineering and technical reasons for those alternatives eliminated from detailed study. However, the BLM has not always included the sound environmental and energy related considerations also used in determining which alternatives should be excluded from detailed study.

Chevron recommends that the many environmental and energy related reasons used to eliminate alternatives from detailed study be added to further support elimination of alternatives from detailed study.

Two examples are provided to illustrate this point.

b. Parachute Creek Property.

Parachute Creek property is located in an area already subject to extensive oil shale development activity. Additional development in that area would exacerbate existing and future environmental impacts resulting from development of adjacent oil shale properties in conjunction with development of the Parachute Creek property. Furthermore, air quality impacts may limit development of the Parachute Creek property in a location so close to existing active projects.

b. Feed Preparation Site Selection Adjacent to the Mine.

This section alludes to environmental and energy efficiency reasons for eliminating this alternative from detailed study. However, highlighting these reasons at the end of the explanation would improve the discussion. The following language might be used:

Because duplicative equipment, duplicative handling, additional storage facilities, emergency energy, emergency power, and dry handling of finely crushed shale are would be required to support this alternative, significant increases in dust emissions would result. Moreover, this alternative would be less energy efficient than locating feed preparation adjacent to the restack, because of the additional electrical power that would be required to transport the crushed shale longer distances to move the feed preparation plant at many times during the operation.

B. COMPARISON OF ALTERNATIVES, TABLE 2A-1

This very important Table provides comparisons according to each environmental parameter of the impacts of each major alternative project configuration. As such, it is one of the most important portions of the EIS because it constitutes the core of the comparison of alternatives analysis which has been referred to as the "heart" of the NEPA process.

The detailed comparison of alternatives on which Table 2A-1 is based appear in Chapter 4 of the EIS. Consequently, the transition from the detailed analyses in Chapter 4 to Table 2A-1 is very important to insure clear understanding of the contents of Table 2A-1. In view of this, we feel that additional language should be added in Section 2A-2 that more clearly explains the transition between analyses in Chapter 4 to general ratings appearing in Table 2A-1 and supporting discussion. All raw data, work sheets or other background documents which assist this explanation should be incorporated by reference in the FEIS.

(See Attachment GC-1) BLM, Vol. III, Appendix I, Appendix II, 1983 BLM, memorandum Comparison of Effects of Reducing the Production Level of the Clear Creek and Paria Alternatives to 100,000 BPD, 1982 and Clear Creek EIS Section 4.3.12

- a. Project life will be 25-37 years at the lower rate of production, compared to 100 years for the higher rate of production. This short project life creates the following concerns:
 - o Conventional hauling may not be appropriate for such a short project life, requiring more utilization of mobile homes and other types of temporary housing.
 - o Conventional home financing may not be available to workers in a project that has such a short life span.
 - o Public facilities and services are likely to either be inadequate for the period of the project, or overbuilt without a long-term population and tax base to support them.
 - o Conventional public financing, such as bond issues, must be carefully structured so not extend beyond the anticipated project life.

In comparison, the 100,000 BPD production rate project has a sufficient life to allow for a more orderly and more permanent expansion of facilities and services.

- b. The construction workforce will build up and decline rapidly for the lower production rate project. The construction workforce will be 5% of the higher production rate project. This rapid build up and decline creates the following concerns:
 - o Facilities designed to serve the peak workforce will be overbuilt for the long-term population.
 - o Those facilities not expanded to serve the peak population will be severely strained during the construction period.
 - o The greater disparity between the total construction and total operations workforce will place more emphasis on temporary housing and other types of temporary facilities.

In comparison, the 100,000 BPD production rate project has a more gradual workforce buildup, a slower phase out of the construction workforce, and the production workforce is 23% of the peak construction workforce compared to 37% for the lower production rate. The smaller the gap between production and construction workforce, the less likely it is for overbuilding to occur.

C. THE BLM'S PREFERRED ALTERNATIVE, SECTION 2A-11

The CEQ regulations mandate that the agency's preferred alternative must be identified in the Final EIS. 40 C.F.R. § 1502.14(a). The CEQ regulations further provide that the Record of Decision prepared by an agency shall identify all alternatives considered by the agency in reaching its decision "specifying the alternative or alternatives which were considered to be environmentally preferable." 40 C.F.R. § 1502.15. The agency preferred alternative is defined in the CEQ Q and Answers as the alternative which the agency believes would fulfill its "statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors." 65 Fed. Reg. 11027 (March 23, 1991).

The difference between the environmental and agency preferred alternatives is that to select the latter the agency must take into account many factors in addition to environmental factors.

For example, the BLM's Right-of-Way (ROW) authority derives from the Federal Land Management and Policy Act (FLPMA) and the Mineral Leasing Act (PLMA) endorses the basic principle of multiple use and sustained yield while the Leasing Act is basically a minerals disposition statute.

This section of the EIS presents the conclusions of all analyses performed in the EIS. Conclusions reached in this section are fundamental to supporting records of decision issued by the BLM, the Corps of Engineers, and other agencies that may rely on the FEIS to support various regulatory actions.

We affirm that the agency's preferred alternative (PFA-100) identified in this section is strongly supported by analyses performed in Chapter 4 and Section 2A of the document. However, we believe that this section should be expanded with the inclusion of the following modifications and additional supporting documentation derived from analyses performed in Chapter 4 and comparisons provided in Section 2A:

1. The Agency's Preferred Alternative should be described and justified in two parts. First, the agency should identify the preferred project configuration and production rate of PFA-100 and provide detailed reasons and justifications for supporting that conclusion. Second, BLM should identify the preferred project components associated with PFA-100 and likewise identify supporting justifications for each component.

2. Additional support for 100,000 BPD Production Rate

Socioeconomic

Production rates of 100,000 BPD are generally preferable to production rates limited to 50,000 BPD for the following reasons:

- c. The property tax base and related sources of public revenues will be smaller for the lower production rate alternatives. This creates the following concerns:
 - o The property tax base will be reduced at a greater rate than the population related to the project.
 - o Severance taxes will be approximately one-half of those at the higher production rate.
 - o Prepayment mechanisms will be proportionately reduced, making it more difficult to meet the needs of the early stage population.
 - o Commitments by the operator will be reduced proportionate to the smaller project.
 - o Sales and use tax revenues will be reduced.
 - o The ability for new growth to subsidize existing systems and services will be reduced, aggravating some municipal shortfalls.

The 100,000 BPD production rate alternative produces significant surpluses for both counties, allowing for some potential revenue sharing with municipalities. It also reduces the per capita shortfall in municipalities and allows the potential for growth to pay its own way.

Resource Recovery

The 100,000 BPD production rate results in maximum use of the resource and is consistent with sound resource recovery practices. This conclusion is supported in Chapter 4, Section 4.3.2.3.

Public Land Management Policies

The 100,000 BPD production rate permits substantially more production over a significantly greater time period, thus contributing to the national need to reduce dependence on foreign energy supplies. The higher production rate is, therefore, consistent with BLM's statutory and regulatory responsibilities to manage the federal lands to best meet the present and future needs of the American people. Moreover, since most of the Clear Creek Project is on private lands, the public lands for infrastructure facilities, such as roads, pipelines, transmission lines, and water resource development, is consistent with multiple use and sustained yield concepts contained in pertinent federal law (e.g., FLPMA).

3. Additional Support for the FI-100 Preferred Alternative

Comments contained in this section are provided as additional support for the FI-100 preferred alternative. It is based on the conclusion that the 50,000 BPD alternatives are not preferred.

Socioeconomics

The BLM conducted a public scoping process which identified social and economic impacts as the number one issue of concern by a three-to-one ratio. These results underscore the public's determination that social and economic impacts are the primary consideration in developing oil field facilities. The significance of this issue is further reflected in the number of meetings conducted with the Corp and government agencies to discuss socioeconomic issues (See BLMAL Vol. II, Section 7.6), included herein as Attachment CC-7.

The five volume socioeconomic assessment (BMLM, 1983) provides the foundation for the socioeconomic discussions in the DEIS. It provides a thorough discussion of socioeconomic issues, consistent with the emphasis placed on these issues in the scoping process.

In considering the socioeconomic impacts of the various alternatives, Fruta 1-100 has the most favorable combination of impacts for the following reasons (Reference BMLM, Existing Conditions, Vol. I, Vol. II Socioeconomic Consequences, Vol. III Appendix Vol. I, Vol. III DEIS Section 3.12, 4.1.2)

- The majority of the project related population is anticipated to locate in Mesa County, primarily in the Grand Valley urban area, under any alternative. That determination was reached by BLMAL and local government officials after extensive consideration of the factors which influence the spatial allocation of population (BMLM, Volume II, Section 4.0).
- The availability of housing, developable land, educational, medical and commercial facilities, an urban level of services and jobs for spouses are among the factors which influence this spatial allocation.
- The housing industry in Mesa County is currently operating at 50% capacity, and is capable of providing a substantial amount of new housing.
- Mesa County, particularly in the Grand Valley urban area, has a substantial public and private infrastructure investment in place. Growth is more easily absorbed into areas with a larger existing population base, an urban level of services, and a substantial existing infrastructure.

7

standards including NAAQS, increments and air quality related values.

- Minimizes air quality related values (visibility, acid deposition) impacts on federal Class I areas by localizing sources.

Geology - Resource Recovery

The FI-100 preferred alternative results in maximum use of the resource. Locating the upgrading plant near Fruta releases approximately 400 acres in the Clear Creek property and hence, additional oil shale resource that could be developed as part of the mine plan. This approach enhances resource conservation and recovery. This conclusion is supported in Chapter 4, Section 4.3.3.2 of the DEIS.

Sound resource recovery practices are consistent with concepts of multiple use and sustained yield mandated in the FLPMA.

Operational Efficiency and Lower Operating Costs

Construction and operating costs of the upgrading plant near Fruta would be lower than operating costs of the facility on the Clear Creek Property for the following reasons:

- Travel time and distance and, thus, commuting costs would be lower.
- The lower altitude and more favorable environment improve the operating efficiency and maintenance of the upgrading plant, thus, lowering operating costs.
- Terrain of the Fruta upgrading site is more suitable for plant location requiring less extensive excavation and engineering fills, thus, reducing capital costs.

Lower Worker Transport Costs

At peak in 1996, 2,470 construction and operational workers would be employed at the upgrading plant. Chevron is considering mass transportation for its employees. (BMLM, Vol. II, Section 7.6, Section 8.4.) Since many of these workers are expected to live in the Grand Valley Area, travel distance, time and costs would be substantially lower for these workers than to travel to be transported to the Clear Creek property as envisioned under the FI-100 and CC-100.

Transportation

Transportation impacts on I-70 would be less for FI-100 than for FI-100 or CC-100. As noted earlier, Chevron is considering mass

9

- Additional growth will help support the existing public and private infrastructure investment, and make more efficient use of many facilities and services. This is more appropriate than duplicating costly and efficient facilities and services in a more rural area.

- Without additional growth, expanded retail activities, and an expanded revenue base, both government and the private sector may suffer.

- Fruta 1-100 places taxable facilities in Mesa County to help offset the growth that occurs even if all project facilities were placed in Corfield County. The detailed BLMAL fiscal analysis (BMLM, Vol. III, Section 7.8 and Appendix II) shows that the Fruta 1-100 alternative provides cumulative surpluses for each county and provides the most favorable balance between demands for services and available revenues.

- Mesa County has a sales tax sharing mechanism which allows revenues to be shared between the County and municipalities to develop services and facilities. By placing taxable facilities in Mesa County, property tax revenues will increase, providing more discretion for the County to share its sales tax revenues.

- As discussed in the production rate comparison comment, production rates of up to 100,000 BPD provide more favorable socioeconomic conditions than do the 50,000 BPD rates.

- As cited in the DEIS:

"...Fruta 1 provides the best balance between population and tax base, the best balance with existing infrastructure, and places growth where it is needed (Mesa County) to support existing infrastructure..."

"...the ability of Mesa County to absorb the majority of the increased population and supply public services, and the location of taxable project facilities in Mesa County are all important considerations..."

"...both counties receive substantial fiscal benefits and substantial surpluses..."

"...the two county area, for the most part, will be positively impacted..."

Air Quality

Advantages to the Fruta 1-100 alternative from air quality are:

- Complies with both Federal and Colorado State air quality

8

transportation of employees to work site, thus minimizing individual employee vehicular traffic. Fewer employees would travel or would be transported from the Grand Valley area to the Clear Creek Property decreasing potential "hotline" in Daheye Canyon. (Reference, BMLM Vol. III, Section 7.8 and Section 8.0.)

Other Environmental Factors

Table 2.0-1 provides impact ratings for each environmental parameter associated with each 100,000 BPD configuration. The impact ratings provide a basis for comparison between the configurations. Table 2.0-1 shows relatively insignificant differences in level of impact between FI-100, CC-100 and FI-100 for noise, ground water, topography, paleontology, soils, aquatic ecology, vegetation, wildlife, cultural resources, land use, recreation, wilderness and energy. These insignificant differences when considered in conjunction with (1) the socioeconomic and other factors identified above which favor FI-100 (2) mitigation identified in 4.1.8, Appendices C-1 and C-2 and the additional mitigation offered in this comment book (section on mitigation herein) support BLM's conclusions that the FI-100 alternative is preferable.

D. ENVIRONMENTALLY PREFERRED ALTERNATIVE

By contrast to the Agency Preferred Alternative, the environmentally preferred alternative is described as the alternative "that will promote the national environmental policy as expressed in NEPA Section 101. This means the alternative that causes the least damage to the biological, physical and human environment. It also means the alternative which best protects, preserves and enhances historic, cultural and natural resources." Id. at 1028. Importantly, "human environment" is defined in the CEQ regulations as follows:

"Human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the Environmental Impact Statement will discuss all of these effects in the human environment." (Emphasis added.) 40 C.F.R. § 1508.14.

The CEQ regulations further provide that the effects of concern under NEPA include indirect effects, defined as "growth inducing effects and other effects related to induced changes in the pattern of land use, population density, and development, which may be direct or indirect and other natural systems including ecosystems." (Emphasis added.) 40 C.F.R. § 1508.14. The same definition also states that effects "include ecological, historic, cultural, historic, economic, social, or health whether direct, indirect or cumulative." (Emphasis added.) Id.

10

16

The human environment definitely includes socioeconomic features and impacts, and in selecting the environmentally preferred alternative, the agency must look at the environment not in a narrow, biologic sense but to the whole "human environment," including socioeconomic factors.

Based on this analysis, it is clear that socioeconomic impacts of the proposed action and its alternatives should be included as a major factor in determining the environmentally preferred alternative.

We believe that the "biologically" preferred alternative identified (CC-30) in Section 2A.1.1 does not constitute the "Environmentally Preferred Alternative" as defined in the CEQ regulations and guidelines. Therefore, we recommend that the BLM reevaluate the environmentally preferred alternative to the FEIS considering the substantial socioeconomic impact and other evidence that favor Fruits 1-100 from an environmental standpoint. In evaluating the environmentally preferred alternative, the BLM should give special weight to socioeconomic factors because socioeconomic concerns were identified as being of primary importance in assessing impacts.

The "No Action Alternative" (Section 2.3.3). As required by the CEQ regulations, the DES includes discussion of the "no action" alternative. However, for greater clarity, the discussion of the "no action" alternative should be expanded in the FEIS to more fully explain why the alternative is not reasonable and why it is not the agency's preferred alternative. For example, we feel the point should be made that, because the project is located almost entirely on private land and requires BLM right-of-way only for access and can be built with any acceptable environmental impacts and without violating any environmental laws or regulations, BLM lacks legal authority to deny the necessary right-of-way for the project.

IV. AQUATIC ECOLOGY

A. AFFECTED ENVIRONMENT

CEQ guidelines call for succinct descriptions of the area to be affected, with less important material to be summarized, condensed, or simply referenced. "The description shall be no longer than is necessary to understand the alternatives." 40 C.F.R. § 1502.15. The data and analyses are to be commensurate with the importance of the impacts. The aquatic ecology section under "affected environment" contains a good description of what kinds of fish are present in the project area and which may be affected by the huge number of alternatives. This is mostly done in Table 12-1. A discussion lists the threatened and endangered fish species should clarify in what stream (River Mile #25-26) these fish occur. (Valdez 1982) The DES incorporates by reference the discussion and inventory of stream bottom life, mayflies, and insects fed on by the fish and the general discussion of productivity

11

16

The Section lacks perspective. It could be improved by establishing the regulatory framework within which the analysis was performed and against which the impact assessments are to be viewed. A layman's description of the operative constraints, e.g., ambient air quality standards, PSD, or State of Colorado standards/increments would be helpful. The regulatory framework should be followed with a discussion of the geographical perspective for the important physical constraints, e.g., Class I area locations and topographical features. Having defined the area over which to be studied, the overall analytical approach and the analysis attempt to address the operative constraints should be more clearly described. A clearer description could help clarify statements such as "The concentrations predicted by dispersion modeling were then compared to the PSD increments..." "accumulated mass concentrations..." "Stage 4-5..." "mass-toperting and upgrading concentrations..." and the title of Table 4.2-8, "Upgrading in Grand Valley Impacts at Mesa County TSP Nonattainment Area."

The combined impact in this Section should clearly assess the overall operation for the configurations involving facilities in the valley and on the mesa. In clarifying the combined impacts it would also be helpful to clarify

- o assessment of construction impacts (see bottom of page 4-2).
- o impacts of the fugitive emission combined with stack emissions (bottom of page 4-3).
- o the analysis of gaseous emissions from mixing (Table 4.2-3)

Table 4.2-3 for Fruits B-79 (Attachment GC-3) should be clearly explained and compared to Fruits 1-100. Tables 4.2-2 and 3. The FEIS should clarify that the 50 MDP configuration (PB-30) contains only three retorting modules to produce 20 MDP. Only three modules are needed because only high grade (31 gpt) ash is processed. The emissions rate for retorting at 30 MDP is less than half for retorting at 100 MDP because only 10 MDP production is limited to processing high grade shale (31 gpt). More modules are needed at 100 MDP because lower grade shale (15 gpt) is processed. Attached is a revised Table 4.2-3 to be revised from 52 MDP to 30 MDP to clearly reflect the production rate alternative.

The overall impact of the valley and mesa configuration should be clarified. A table on increment comparison by configuration should be included in the FEIS or simply clarify. "It contains 79 out of an allowable increment of 91" See Table 4.2-7. The text should reflect the receptors used in the modeling analysis were placed as to pick up the highest concentration. The analytical details such as receptor locations and meteorological input should be referenced to Chevron 1993 d, f.

13

16

and function of the aquatic community in the ecological system all of which are contained in the Chevron baseline reports as referenced in the footnotes (Chevron 1981a, 1981b, 1982a) and references (Muir et al. 1982, Valdez et al. 1982). These referenced studies contain more than sufficient detail to support the existing aquatic environment. We hereby submit the attached report prepared by Dr. R. J. Behler for fish and aquatic impacts. (Attachment GC-3)

Chevron and its consultants believe adequate data exists to make a professional judgment on the presence or absence of candidate, threatened or endangered species in the vicinity of the Defoliate intake, as noted in Attachment GC-3. The available baseline data and analysis in the FEIS is adequate to allow a decision-maker to determine any differential impacts between alternatives.

B. IMPACTS

The section begins with the statement that the Fish and Wildlife Service (FWS) is presently fulfilling the requirements of the Fish and Wildlife Coordination Act and the Endangered Species Act, and that Chevron and GCC are "providing the FWS with significant additional information." For these reasons, the DES continues, "this section should be regarded as a first approximation of the likely impacts associated with the CCSDP, including all of its alternative configurations. It is anticipated that the additional information available to the FWS will allow them to further refine both the probability and magnitude of these impacts."

The subsequent analysis in 4.7 and our Attachment GC-3, belies this statement since it may claim it is quite detailed and far from a first approximation. There is no agreement on Chevron's part to provide any "significant additional information." Chevron forcefully asserts existing information is adequate. As the attached report by Dr. Behler indicates analyses are sufficient to conclude not only that the project will not jeopardize the continued existence of threatened or endangered species, but that no prohibited taking of them or their habitat will occur. Section 4.7 should be revised to reflect and include the information and analysis contained in Dr. Behler's attached report.

V. AIR QUALITY AND METEOROLOGY

This section is technically detailed based on the three valley PSD permit application (Chevron 1982a, D submitted by Chevron to EPA, however, for greater clarity, this section should be revised in accordance with the following comments.

12

VI. TERRESTRIAL ECOLOGY (SECTION 4.8)

Section 4.8 repeatedly indicates that a "baseline" evaluation of impacts must await future completion of the USFWS Biological Opinion. The DES analysis is separate from the Biological Assessment. Table 2-4-1, which notes the critical "impact comparisons" among major alternative project configurations, specifically enumerates impacts on threatened or endangered plant species. This is misleading because Table 2-4-1 on impact comparisons for reservoirs clearly indicates threatened and endangered plants as the main concern for site selection. The footnote in Table 2-4-1 should indicate all configurations have similar effects. Initial and reservoir selection and operation were evaluated for impacts on threatened and endangered species. These impacts were considered for project configuration analyses (Table 2-4-1).

Chevron forcefully asserts existing information is adequate. Analyses are sufficient to conclude not only that the project will not jeopardize the continued existence of threatened or endangered species, but that no prohibited taking of them or their habitat will occur. The DES detailed analysis of the impacts of the proposed action and alternatives thereto on terrestrial ecology, including threatened or endangered species is adequate.

VIII. MITIGATION

The CEQ regulations require that an EIS identify and discuss appropriate mitigation measures for all types of adverse environmental impacts that may be caused by the proposed action and its alternatives. 40 CFR Section 1502.14(f), 1502.14(f). Chevron believes that additional mitigation measures should be added to Section 4.8.1 Appendix C-1 to strengthen the mitigation section of the FEIS. Specifically, we recommend including the following points:

A. AIR QUALITY

At all times during construction and operation of the Clear Creek Shale Oil Project, the operator is required to conduct its activities in accordance with all applicable air quality laws and regulations and all required permit conditions. Chevron will make all required air quality data available to all facilities and activities included in our PSD permits. In addition, Chevron will, within the limits of all applicable federal and state air quality emissions permits, observe required emission limits.

B. PALEONTOLOGY AND CULTURAL RESOURCES

Although thorough analyses of the impacts of project development on paleontological and cultural resources have been performed and are included in the DES, the operator agrees to perform pre-construction surveys. (Attachment GC-3)

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C. AQUATICS AND WILDLIFE

A number of aquatic wildlife mitigation measures are identified in Section 4.15 and Appendix C-1. In Appendix C-1, the operator has agreed to commit to certain mitigation measures. In addition to those already committed in Appendix C-1, the operator agrees to include in the FEIS as committed aquatic and wildlife mitigation those measures identified in Attachments GC-3 and GC-6.

D. SOCIOECONOMICS

The operator has described MITIGATION STRATEGY, GENERAL APPROACH TO MITIGATION, (Housing, Government Finance and Community Infrastructure, Transportation, Recreation and Human Services, and Mine Closure) and SPECIFIC MITIGATION MEASURES, GARFIELD COUNTY AREA, MESA COUNTY AREA. These items are described in detail in Section 4.5, Volume III, RMMA, 1982. In order to accurately reflect our mitigation plans these items should be reprinted in their entirety in the Final Environmental Impact Statement. Specific text of the above referenced materials is included by comment in Attachment GC-6.

16

Line Item Comments
Bureau of Land Management
Clear Creek Shale Oil Project
Draft Environmental Impact Statement

Page ii, Abstract

Second sentence should read "The project includes a combination underground/surface mine, retool and upgrading facilities, a water system two (2) storage reservoirs."

Page viii, Description

Second sentence should read "The major components of the project would consist of an underground and open pit mines retooling and upgrading of shale oil, spent shale disposal in upper Clear Creek canyon and in the open pit, a GSC Shale Venture storage reservoir in Roan Creek."

Page xviii

The analysis and conclusions discussion of the Fruits I alternative puts this alternative in an misleading adverse context. Only the areas of "more-negative" impact are presented. In fact, the actual comparison (pg. 2-32) with PA-100 shows 10 areas "more-negative" and 6 areas "less-negative".

Page xviii, Fruits II

The Fruits II alternative is only 30 MBPD. This discussion appears to apply to 100 MBPD. Impacts are lower compared to what configuration?

Page xix

Line 1 - There are six water supply systems, not two. See pages 2-3, 2-4.
Line 15 - Only 2 water systems (and minor ones at that) are discussed here. It is suggested that the following language be used: "The Debeque System, the Lema System, the Clear Creek Mesa System and the Well System are all required to supply water to the project. Due to the size of facilities involved, the relative amounts of water to be diverted, the Mesa System and the Well System would cause less impact than the Debeque and Lema systems. The Parachute and Clear Creek Mesa systems are alternatives to the Debeque System. It is estimated that the impacts caused by these three alternatives would be approximately equal."

Line 17 - The Lema Diversion has the lowest associated impacts of all the proposed Colorado River mainstem diversions. See Table 2-4-7 on page 2-70.

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Line 19 - Table 2-4-8 (2-72) does not support the conclusion that Lower Dry Fork would have lowest impacts of the reservoir sites. The Lower Dry Fork conclusion is solely based on lowest impacts to T&E plants. The geological and safety considerations would suggest Upper Dry Fork is preferred. (See Attachment 9C-1.)

Page 1-1, Background

A land ownership map would be useful to distinguish public from private lands.

Line 7 - "12700 acres" should be "13700 acres."

Page 1-2, Background

Line 7 - The word "an" should be removed from between the words "to" and "intake" and an "n" should be added to the end of the word "structure."

Page 1-4, EIS Regulatory Actions

Section 1.2 is concluded with the statement that "This EIS is intended to satisfy NEPA requirements for both BLM and Corps of Engineers actions." This statement should be changed in the FEIS to reflect that the EIS is intended to satisfy NEPA requirements for all federal agency actions required for final approval of the CCSP as well as all environmental analyses required to satisfy the laws and regulations of Colorado, Garfield and Mesa Counties, and other local jurisdictions. There are numerous other federal actions which may require the support of the Final EIS.

Suggest the addition of a fourth bullet for the Corps of Engineers Section 10 Permit (River and Harbor Act) for the structures in the river. Actually the who permit is only for dredging or filling.

Page 1-5, Federal

First sentence: Fish and Wildlife Coordination Act of 1934, revised 1936.

State of Colorado Division of Water Resources. This should state that the approval of plans and specifications is required for all dams "that are in excess of ten feet in height, or have a capacity of more than 1,000 acre feet, or have a water surface at the high water line in excess of 20 acres."

Page 1-6, Scoping

The EIS states that certain issues were deemed insignificant during the scoping process and are not addressed in the EIS. The CRO regulations state that, for such issues, there should be a "brief presentation" of why they are not

significant or a reference to their coverage elsewhere. 46 C.F.R. 5.120.(1)(3). Attached is the treatment of Significant Issues from the BLM's Prototype Scoping Program document. A similar treatment is suggested from the CCSP FEIS.

Page 1-9, Purpose and Need for the Project

Greater emphasis should be placed on the political reality, both National and International, as to why we are spending \$6 to 10 billion for a shale oil project. The most important issue raised by the purpose and need section is there is a need for this synthetic fuel. In the fifth paragraph, last sentence, clarify in the FEIS shale oil is an alternate energy source.

Page 2-1, Introduction

Suggest the first sentence be deleted to eliminate confusion of comparing Proposed Action to Proposed Action.

Page 2-3, Table 2.2-1

Line 14 - delete "initial"

Line 19 - Big Salt Wash Near Lema Reason for inclusion should read: Feasible as a supplemental source.

Line 26 - Ruedi Reservoir should be included as a feasible supplemental water source because Chevron and Conoco have applied to purchase water from Ruedi Reservoir. The UDSB is preparing a supplemental EIS on its 2nd water sale at this time. Water rates and delivery schedules are uncertain at this time.

Water Supply Systems at Lema should be reordered to read:

Diversion/Route B ...	Good access to intake site and good
Diversion/Route C included	
river hydraulic (PA100 ...)	
Diversion/Route A ...	Limited space would create a sediment
Diversion/Route D eliminated	
handling problem	
Diversion/Route E ...	Poor access and facility siting
Diversion/Route F eliminated	
conditions	

2

3

Page 2-4, Table 2.2-1

Line 9 -- Under Reasons for Inclusion/Elimination, the reference to Union's studies should be deleted since the Union EIS is not available for the public review.

Line 16-20 -- Delete "Rundi Reservoir through Other Sources". These are incorrectly included under Water Supply Systems. They are water supply sources.

Page 2-11, Facility String Alternatives Producing 50,000 bpd

Second paragraph, second sentence, the use of the terminology modules is confusing, suggest use unit or facility.

Figures 2.3-1 through 2.3-4

Arrows are also needed to locate transmission lines, pipelines, water lines, gas lines, etc.
All figures show the wrong point of GCC diversion. Should be located below DeBeque.

Figure 2.3-1

The Loma Diversion points are not correctly located. These points should be labeled for the readers benefit. The dam site of both Conn Creek sites are incorrect, please see attached map. The GCC (DeBeque) Diversion is incorrectly located.

Figure 2.3-2

The Conn Creek reservoir sites are improperly located. See correction Figure 2.3-1.

Figure 2.3-3

See comment Figure 2.3-1 Upgrading facilities are incorrectly shown to be on the Mesa ... they are at Fruita in the P-100 case.

Figure 2.3-4

See comment Figure 2.3-1

Page 2-35, Water Rights

Add the following new paragraph after the second full paragraph on page 2-35:

"Chevron and Conoco have made a request to the U. S. Bureau of Reclamation to purchase from Rundi Reservoir, 15,000 acre feet and 10,000 acre feet of water, respectively. The Bureau has published an Environmental Assessment as part of its evaluation to select a preferred alternative water sale scenario. It is our understanding that the Bureau intends to prepare a Supplemental EIS addressing that preferred alternative in the future. At this time it is not possible to identify water rates and delivery schedules which might be available from this water supply. The supply, if it were to become available, would supplement the yield from junior water rights referenced above when not in priority. Since the water would be withdrawn from the Colorado River, it is expected that the infrastructure for diversion from the river and delivery of such water to the project would be utilized."

Well System

Seventh paragraph Strike the last two sentences thereof and substitute the following: "The final configuration of the augmentation water system will be as determined under Colorado Water Law in order to protect affected senior user(s) this water would be delivered by pipeline to required locations."

Page 2-31, Water - Development Plan - Phase II

Line 5 -- Delete the word "of" between the words "using" and "large."

Line 6 -- Change last sentence to read: The full scale DeBeque and Loma systems would be utilized to deliver this water.

Page 2-31, DeBeque System

Line 11 -- Delete the word "separate."

Fourth paragraph, second sentence should read: "Figure 2.3-1 shows the approximate locations of intake sites being considered."

Fifth paragraph, second sentence: All pipelines (water, intertie (2-43), product (2-33,44), and natural gas (2-36,44) are buried.

Page 2-32, DeBeque System

First paragraph, fourth sentence: Depending on future needs, the Total reservoir capacity, including dead storage could be as much as 175,000 Acre Feet. The proposed reservoir is located at the Upper Dry Fork site shown in Figure 2.2-1.

Page 2-23, Upgrading

Line 6 -- Should read "less than 0.1" not "less than 0.05."

The discussion of the upgrading process on page 2-23 should include a more specific explanation of what type of water treatment will take place before the water is used for sport shade conditioning (Moore 1976d).

Page 2-23, Table 2.3-3

The units on PM should be grains per SCF or per dSCF, not just SCF.

Line 8 -- BACT for SO₂ should read "process chemistry."

Figure 2.3-10 -- Delete "Solids Removal". This operation occurs in retorting process.

Page 2-25, Table 2.3-5

Should explain that "g" represents grains not grams.

Page 2-26, Table 2.3-6

The Calcite and Columbite/Antlerite numbers may decrease with a corresponding increase in CaO and MgO.

Spent Shale Disposal -- Second paragraph "Mesa Valley Fill" is not identified as such on Figure 2.3-1.

Page 2-27, Spent Shale Disposal

Last paragraph mentions Mesa Valley Fill site again, however, no map location. Refer to previous comment. "Zones I-V techniques" mentioned should be clarified.

Page 2-28, 2.3.2.4, Project Support Facilities

The FES should include a discussion of wastewater treatment for human wastes and industrial wastewater (Moore 1976d).

Page 2-28, Water Sources

The last bullet (northern portions of the Piceance Basin) is not included on Table 2.3-1 under Water Supply/Primary Sources (p. 2-3).

Line 10 -- Add "Diversion A" between the words "diversion" and "and."

Page 2-28, Spent Shale Disposal

This sentence should be clarified by referencing Appendix A, section F, pp. 40 where spent shale disposal alternatives were considered and eliminated from detailed study by BLM.

Water Supply and Control

Last paragraph, last sentence should read: "These sites referred to as Lower Dry Fork, Upper Conn Creek, and Lower Conn Creek, would have similar characteristics to the Upper Dry Fork sites."

Page 2-29, Loma Intake and Pipeline Routes

For consistency with Table 2.2-1 Diversion/Route B should be labeled "Diversion/Route C" and vice-versa. Route B would follow a northeasterly course to a point approximately 1.5 miles from the diversion. Diversion C would be approximately 1.5 miles downstream from Diversion A.

Line 28 -- Add the words "of diversion" between the words "point" and "and."

Page 2-40, Transmission Lines

In the Big Salt Wash - Echo Lake Route on Figure 2.3-1 the brown line running northwesterly, if so, why not use an arrow to identify. Refer to Figure 2.3-1 comment above.

Page 2-41, Overview

First paragraph, last line, there is no Figure 2.2-3. It should be Figure 2.3-3. This figure should be referenced more often.

The discussion of the Fruita I project configuration on page 2-41 states that the upgrading facility processes would not change significantly from the Proposed Action. Wastewater from the upgrading process would be used for spent shale conditioning under the Fruita I configuration. The disposition of wastewater from the upgrading facility under the Fruita I configuration is pumped to mesa.

Page 2-41, Water Supply and Control Systems

Power Requirements -- Change (Section 2.3.2.4) to (Table 2.3-11) for easier reading.

16

Figure 2.3-13, 2.3-14 — This map needs more than 16 Road as a landmark.

Page 2-46, 2.3.A.3, Facility Sites and Processes/Feed Preparation

Line 20 & 23 — The impression is given that Feed Preparation will occur both at the mine and at Fruita. Primary crushing will occur at the mine. Secondary and tertiary crushing will occur at the Fruita II plant site.

Line 27 — Correct the sentence to read: "These facilities would include two upgrading and three retorting modules." Note the numbers are reversed in the present text.

Page 2-49, Methodology

First paragraph citation should read (U. S. BLM, 1982a) to correspond with section E.O. References.

Major Project Configurations — Residual "activities" should be changed to residual "impacts" to correspond to the Glossary and Appendix B-1.

Page 2-49, 2-50, 2-51, Major Project Configurations

Under all project configurations water diversions will occur on Clear Creek Mesa and from the alluvial and bedrock aquifers in addition to those at Debeque and Loma.

Page 2-51, Air Quality

It is noted that PA-100 and CC-100 alternatives involve exceedance of the nitrogen dioxide annual standard based on all nitrogen oxides converted to nitrogen dioxide. The significance of the nitrogen prediction for NO₂ nitrogen dioxide. The NO₂ represents only 3-10% of NO_x therefore, no exceedance of the NO₂ standard is predicted. (APCA 1218/79) As noted under the air quality analysis, the rate of conversion is critical for both nitrogen oxide and ozone impacts. As discussed in some length under the air quality impact section, there are strong air quality reasons for the selection of the Fruita II alternative as opposed to the proposed action of Clear Creek — 100 alternatives. These considerations should be added at page 2-51 to the air quality analysis.

Table 2-4-1 — The impact comparison table includes a footnote "4" with respect to vegetation impacts, stating that impacts to threatened and endangered plant species are not included. The statement should be clarified. The impacts on threatened and endangered plant species have been included in the comparisons contained in Table 2-4-4, which are incorporated in Table 2-4-1.

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Page 2-59, Table 2-4-2

Data are available to present findings of worst case analysis of the socioeconomic impacts at 30,000 BPD. (See Attachment GC-1.)

Page 2-61, Spent Shale Disposal Sites

It is stated that "The amount of spent shale at the Mesa Valley fill would be approximately 100 million cubic yards for 150,000 BPD, 950 million cubic yards for 30,000 BPD." More spent shale is produced at the 30,000 barrel per day level than at the 150,000 barrel per day level because the 100 BPD configurations use the open pit for spent shale disposal, thus minimizing the need to dispose of spent shale in the surface disposal area (Mesa Valley Fill).

Page 2-63, Air Quality

Line 3-4 — The site location must be sufficient to achieve compliance with total suspended particulate standards at the property boundary. The sentence on "The site location ..." should be deleted.

Line 13-15 — The ambient temperature at Grand Valley and Clear Creeks are both much less than the meteorological temperature of spent shale at 170°F, therefore the rate of evaporation at either site would be similar.

Page 2-64, Vegetation

Line 19-21 — No threatened and endangered plants are known to occur in the four Grand Valley spent shale disposal sites. Neither CNVI or BLM have listings of plants in those areas.

Page 2-64, Wildlife

Line 26-30 — Critical winter range and nest site information for Munger Creek and Berkey/Bentley creeks is available from the COWR, and is equivalent to baseline information. The available data on critical winter range and nest sites collected for Garvey Canyon is similar to that for Berkey/Bentley Canyon and Munger Creek suggesting similar impacts. See map 2-61 Chevron 1982a.

Page 2-69, Water Supply and Diversion Point Alternatives

Line 8 — This sentence should read "The impacts of the following water diversions were evaluated." The minor headings "Water Supply" and "Diversion Points" should be deleted and the 3 listed diversions presented, one under the other.

10

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Page 2-73, Groundwater

Lines 38-43 — This summary needs to clarify the alternatives comparison. If the principal groundwater impact is from the open pit mine, why is the PE-20 alternative the highest impact?

Page 2-74, Geology

Line 30 — A sentence should be inserted offering justification for Lower Dry Fork Reservoir over Upper Dry Fork. To believe the data supports Upper Dry Fork site as more geologically sound.

Second paragraph — Geologic resources, sand/gravel/earth materials would be used in the construction of the proposed earth and sand embankment.

Page 2-75, Aquatic Ecology

Line 17 — Operational impacts between 30 MBPD and 100 MBPD are an important consideration. The water demands at 30 MBPD are less than half those of 100 MBPD. (See comments DEIS page 2-76, 4-70-74, herein, and Attachment GC-3.)

Line 19-23 — This summary should more clearly address depletion effects, and the effects on threatened and endangered fish. (See comments DEIS page 2-76, 4-70-74, herein, and Attachment GC-3.)

Line 35 — Impacts of all configurations cannot be low to medium adverse. Given the water demands are identical for all 100 MBPD configurations and all 30 MBPD configurations, then the 30 MBPD are low and the 100 MBPD are high. The effect of the CCCC Project, versus the GCC Project are not clearly delineated. The difference between Chevron only impacts at 231.23 cfs and GCC at 442.27 cfs should be indicated. (See comments DEIS page 2-76, 4-70-74, herein, and Attachment GC-3.)

Paragraph 3, the second sentence states that "Impacts of all configurations would be low to medium adverse." This statement needs clarification since the Colorado River withdrawals are projected as a potential water shortage. This probable impacts to the 100,000 bpd facility and stating the unlikelihood of the changes for occurrence of the worst case may place these statements in perspective. As it is now stated, an inconsistency exists between the above quoted language and impact projections provided later, see for example, pages 4-70-74 and 4-146.

Page 2-76, Transportation

Last paragraph — The third sentence in this paragraph should be deleted. The reference to Section 4.13 is sufficient to allow the reader to compare transportation impacts.

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Line 12 — Add the words "and bedrock" between the words "alluvial" and "and/or."

Surface Water. The first sentence states that "The impacts of water supply systems could reduce stream flow and affect downstream water users." This paragraph should be modified with the addition of a sentence as follows: "The Colorado water rights doctrine protects senior or prior appropriated users from adverse impacts. The obligation to augment flows in so as to prevent injury to downstream senior users will mitigate against potential adverse effects to downstream water users." See also page 2-50 which reveals a lack of intersection between surface and ground water in the upper Clear Creek Canyon.

Ground Water. This section may overstate the adverse impacts to ground water associated with the alluvial well system. Since the terms "highest" and "lowest" degrees of impacts are underlined, the descriptions are not meaningful. It's a range of evaluations within an envelope of insignificance. In paragraph 4, the second sentence relates to increases in the levels of salinity and downstream alluvial ground water quality adjacent to the Colorado River. This statement should be modified to indicate that such increases, if at all, would be negligible, perhaps not even measurable and thus insignificant.

Page 2-70, Table 2-4-7

Delete the column headings "Water Supply" and "Diversion Points" and replace with one heading "Water Diversions."

Page 2-70, Aquatic Ecology

The second paragraph in this section needs to be reworked to more factually portray the actual withdrawals associated with the 100,000 barrel per day Clear Creek Oil shale project and to reflect a discrimination between Chevron's project and the total GCC projects. The 30-percent depletion figure should be modified or placed in proper context. The statement that maximum diversions could be made at any time including winter, should be revised to reflect the relative priority of the water rights of Chevron and GCC joint ventures. Given the high percentage of withdrawal stated here and the existence of endangered species, this section portrays in essence a "worst case" which may or may not be likely to occur and may or may not be permissible in the view of the Corps of Engineers.

Further, this impact analysis is too simplistic. The Goddard model which was used assumes that the fish are uniformly distributed throughout the river area, it also assumes they are present throughout the year. Neither is true at the Debeque intake area. First, there is no evidence of threatened or endangered fish in the area. Second, they are fishes swimming actively in the water. Third, the planned 2 gpm velocity is more than adequate for fish escape velocities at an intake. Fourth, the 33% water withdrawal is a maximum this percentage is lower during the critical low flow periods. It is a function of water rights. Thus, the impact analysis in the PEIS should reflect these factors.

11

This summary fails to distinguish 50 MBPD, 100 MBPD and GCC full operation (100 MBPD). Therefore, the maximum monthly average percent diversion may be 3.7%, 11% and 32% respectively.

A weir at the intake would attract fish downstream of the device, and generally not cause entrapment.

Maximum diversion cannot take place at any times only these times when water rights allow. No non-model larvae or fish are discussed whose swimming ability would be significantly impaired.

The potential loss of aquatic organisms should be discussed at different diversion levels such as 5%, 11% and 32% level of the reservoir withdrawal. Clearly, the effect of the CSCP project at different production rates should be distinguished from the GCC.

This section should be modified in the FEIS in accordance with these factors.

Line 6 — The words "Garden Gulch" should be changed to "West Parachute Creek."

Line 12-13 — A lower flood hazard is not totally related to the height of the dam for the four Roan Creek reservoir sites. Flood hazard is partially a function of dam height, more importantly a function of the volume of water impounded, geologic conditions, hydrologic conditions, and many other factors. The analysis on 4-3 indicated that during a major failure of Upper Dry Fork the inundation at DeBeque would be 26-37'. This analysis should be modified in the FEIS to reflect these factors.

Line 39 — Second sentence: Change the word restrict to prohibit or prevent. Generally, as is common in western dam construction, the borrow areas are those which would be inundated. Consequently any geologic resource within this area would be used in dam construction.

This table leads to the conclusion that Upper Dry Fork has less impacts than Lower Dry Fork. The conclusion on pages 16 and 2-73 is based purely on threatened and endangered plants without regard for other disciplines. These conclusions should be modified in the FEIS to reflect consideration of factors other than just T & E plants.

Line 12-14 — Data submitted by Chevron and the GCC does not support this conclusion. There are not significant aquatic biota (benthic) below Clear

This table leads to the conclusion that Upper Dry Fork has less impacts than Lower Dry Fork. The conclusion on pages 16 and 2-73 is based purely on threatened and endangered plants without regard for other disciplines. These conclusions should be modified in the FEIS to reflect consideration of factors other than just T & E plants.

Line 12-14 — Data submitted by Chevron and the GCC does not support this conclusion. There are not significant aquatic biota (benthic) below Clear

In this section (pp-91), such as "air quality impacts would be within acceptable limits" do not do justice to the detailed comparisons made elsewhere in the FEIS, which (for example) demonstrate that there are enormous differences in the air quality impacts of project alternatives, some of which are not at all within "acceptable limits." There appear to be good reasons for BLM to select the Fruit 1-100 alternative as preferred, including socioeconomic, geologic, air quality and other factors. It would materially improve the FEIS to articulate fully and pull together all such factors in an expanded Section 2.4.11.

Line 37 — A modified design DeBeque intake is not clearly indicated in 2.7, other than the potential for infiltration that is not feasible at DeBeque. If modified design is traveling across (B-10-170) this is not practical given the sediment loading. Modified design must be clarified, and have some sound engineering basis.

Line 31 — The Upper Dry Fork sites should be preferred based on the analysis in Chapter 1.

The measured maximum ambient lead concentration is 10 $\mu\text{g}/\text{m}^3$ on the Clear Creek Mesa.

Table 2-2 — See Attachment SC-3 Suggested Revision.

It is noted on page 2-6 that "modeling of acid deposition from the CSCP facilities have (sic) not been performed, but should be low based on previous studies (Poe et al. 1981)." Such deposition is estimated on page 4-6 and is modeled for alternatives (1-15).

It is stated in this section that measured concentrations exceed the national secondary ambient air quality standard of 60 $\mu\text{g}/\text{m}^3$ and that the Grand Junction/Fruita area is classified as nonattainment for TSP. The FEIS should clarify that 60 $\mu\text{g}/\text{m}^3$ is not a standard, but a guideline. The Grand Junction/Fruita area which was classified as nonattainment for TSP does not include the upgrading site.

It is also noted that the relatively high 24-hour maximum at Mack (121 $\mu\text{g}/\text{m}^3$) "was reportedly caused by wind-blown dust." The EPA guidance document (Hawkins, 1977) states where wind-blown dust is responsible for nonattainment the area should not be classified as nonattainment. State Implementation Plans in Texas and New Mexico acknowledge wind-blown dust was responsible for violation of the particulate NAAQS which could be added. The 121 $\mu\text{g}/\text{m}^3$ reading is given as a "peak." The 24-hour particulate standard allows one exceedance per year. Therefore, the second highest 24-hour reading is the relevant background concentration. This background number is responsible for predicted ambient violations shown in the FEIS for some alternatives. Correct p. 2-9, Table 2-2-4, and the impact analysis.

Creek/Roan Creek confluence. See documentation submitted for Colorado Stream Classification Hearings, 10/11-10/13 and Chevron 1991. Our baseline indicated aquatic biota is uniform throughout the Roan Valley area.

This is not consistent with the Chevron baseline data on wildlife in GCC reservoir area. This report is not cited in Chapter 8. The analysis should be revised in the FEIS to be consistent with data used in the analysis.

Line 4-3 — The Roan Creek drainage T&E plant populations are addressed in 2.4.2. This discussion should clearly distinguish the corridor where only sensitive plants exist from the reservoir sites where a T&E plant is known.

Line 6-7 — The aquatic ecology impacts are not directly related to the length of the pipeline, rather they are related to the potential for affecting aquatic biota. This analysis should be modified in the FEIS to reflect this factor.

Line 11 — The FEIS should reference or explain the criteria used for determining a "population" of trout. Does one fish constitute a population?

Paragraph 2 — The operator intends to limit parking at the Clear Creek Mesa site to buses, operator vehicles, and designated car pool vehicles in order to minimize vehicle traffic.

The reference to total use of private cars should be eliminated for the Clear Creek Mesa, consistent with the change noted in paragraph 2 above.

Line 7 — The effect of air quality from buses versus car pooling can be simply calculated. Specific data are available from 312 and application of AP-42 and the high altitude emission factors.

There is a need to draw more on Table 2-4-1 and the other Chapter 2 Tables in arriving at the decision expressed in Section 2.4.11. Furthermore, statements

There is a need to draw more on Table 2-4-1 and the other Chapter 2 Tables in arriving at the decision expressed in Section 2.4.11. Furthermore, statements

The opione standard for one hour is given as 235 $\mu\text{g}/\text{m}^3$. This is determined by an expected exceedance method and is not an absolute 1 hour standard statement should be clarified in the FEIS.

The statement regarding projected water consumption by the year 1990 should include an explanation of the basis for this projection or reference CRBSCF 1991.

The statement that salt loads contributed by municipal and industrial uses are of minor significance and should have a further explanation or citation.

Water Supply — It is Lee Ferry, Arizona. Also note that allocated share for Colorado consumption should be 2,499,30 acre-feet.

Water Use, Fourth sentence — "Stream flows would be substantially altered." Clarify this sentence with reference to present/past impoundment periods?

This section which addresses salinity can leave the reader with the impression that a Salinity Control Program is not in existence. The section should be expanded in the FEIS to describe the existence of the Colorado River Salinity Control Act of 1974 (CRSCA), the status of the control measures being implemented pursuant thereto, and the Colorado Water Quality Control Commission's approval of the baseline approach and numeric standards at points in the lower Colorado Basin. This section should also point out that the underlying premise of the CRSCA is that full fulfillment of Colorado River water shall continue while salinity control measures are being implemented. It should also be stressed that the water quality standards for salinity, approved by the Colorado River Salinity Control Forum, adopted by the state of Colorado and approved by the EPA have been found to be in compliance with the Federal Clean Water Act. This section should not only identify the nature of the problem, but also point the impacts of the proposed project into perspective with the entire basinwide approach and program.

Roan Creek Drainage, third sentence should read: Roan Creek flows downstream through a U-shaped valley with valley floor widths ranging from 25 to 150 feet on the plateau and from 300 to 1500 feet in the valley bottom.

The discussion of Clear Creek stream flow on page 3-15 appears to be based on one one-year New Mexico event. The discussion in the FEIS should acknowledge that significant year-to-year fluctuation in stream flows is possible.

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Fourth paragraph, last sentence -- Should be clarified in the FEIS to indicate that data indicates that portions of Clear Creek normally flow only during spring runoff.

Third paragraph, third sentence should be corrected in the FEIS to read: The annual yield of these drainages ranges from 122 acre-feet for No Name Creek to 10,473 acre feet at C3 23 page on Clear Creek.

Page 3-17, Table 3-6-3

Station C1-23 should be shown as C2-23.

Page 3-18, Table 3-6-4

The water quality table on page 3-18 indicates that several parameters were "not detected." Because detection limits can vary substantially, it would be more complete to either list the detection limits used, or at least state the general basis for the detection limits used (e.g., EPA Standard Methods). This should be corrected in the FEIS.

Page 3-19, Roan Creek Drainage

The discussion refers to a water quality classification recommended in 1976. In the final EIS, the discussion here and throughout the water resources section in Chapter 3 should reflect the fact that on February 14, 1983, the Colorado Water Quality Control Commission finalized new use classifications and numeric water quality standards for the various streams and tributaries in the project area, including Clear Creek, Roan Creek, and the mainstem of the Colorado River.

Page 3-20 and 3-21, Grand Valley and Associated Siting Alternatives

The discussion in the FEIS should clarify the relevance of the Piceance Basin to the proposed project. Presumably, the Piceance Basin ground water formations extend beneath the Clear Creek project site.

Page 3-24, Figure 3-4-6

CC-4J should be shown with CC-4A, B, J.

Page 3-28, Table 3-4-5

The labels contained in the table on page 3-28 regarding alluvial well water quality are confusing. Each of the first two columns in the table indicates samples obtained from well "CC-ALL-4." Presumably, one of the columns is mislabeled.

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Page 3-49, Table 3-8-3

Sagebrush Shrubland do not support Prairie Rattlesnakes; they may support the Western Rattlesnake, *Crotalus viridis*, and the Great Basin Gopher Snake, *Pituophis m. deserticola*.

Page 3-51, Threatened and Endangered Species, Plants

At several subsequent locations, there are references to species "not of high federal interest." The source, basis, and significance of this characterization should be explained in the FEIS.

Page 3-52, Wildlife

There is a statement that certain areas have been designated by the Colorado Division of Wildlife as "essential habitat" for the peregrine falcon. It should be noted in the FEIS that under Colorado law there is no formal process for the designation of "essential habitat," and no binding legal significance to such designation.

Third paragraph, peregrine falcon. Habitat cannot be essential if the species is not present.

Page 3-53, Sensitive Habitat

First paragraph: Sensitive habitats have no regulatory status at present, and this should be reflected in the FEIS.

Page 3-54, Figure 3-8-1

Source (BLM 1980a) should be referenced in the FEIS.

Page 3-54 and 3-55, Figure 3-8-1 and 3-8-2

The GCC point of diversion is located just downstream of DeHeque, not upstream as shown in these figures. Also the Leona point of diversion is near the theoretical extension of 16 Road and the Colorado River. These changes should be made in the FEIS.

Page 3-56, Clear Creek Mesa and Associated Siting Activities

Second paragraph Chevron (1982m) cited reference does not discuss all the species discussed within this paragraph, therefore include Chevron (1986j) citation for completeness.

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Page 3-56, Alternative Siting Activities

First paragraph: The alluvial deposits are thicker in the Conn Creek reservoir effluents. Geotechnical investigations show that all sites are somewhat different.

Page 3-61, Aquatic Ecology

Second paragraph, second sentence add: Only eight of which are native fishes, with the remainder being introduced in the last 100 years.

Third paragraph: Miller et al (1982 (Part III fisheries report)) suggests that water quality is not limiting the threatened and endangered fish. However, predation by non-native fish may be impacting the populations. (Attachment CC-3.)

Seventh paragraph, first citation is incorrect, should read (Kid 1977/Walk 1975).

Page 3-62, Table 3-7-1

Carri Creek, Threatened and Endangered fish present should read yes.

In a 1982 fish sampling program of the West Fork of Parachute Creek, no endangered or endangered subspecies were found (Engineering Science for Getty).

Page 3-63, Table 3-7-2

Historic and Present Status columns are reversed.

First paragraph, third sentence -- In a 1982 fish sampling program of West Fork of Parachute Creek, no endangered or endangered subspecies were found. (See reference 3-62.)

Page 3-65, Terrestrial Ecology

Fourth paragraph: Why is Graham, 1937 reference cited? The Terwilliger et al. 1974 is much more up to date and complete and should be used.

Page 3-66, Mammals

The discussion on page 3-66 and the table on page 3-67 contain references to the Piceance Basin. Again, the relationship between the project area and the area considered to constitute the Piceance Basin should be clarified in the FEIS.

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Page 3-62, Clear Creek Mesa and Associated Siting Activities

First paragraph, last sentences Clarify in the FEIS that the Class III cultural resource field surveys of the Dry Fork Reservoir sites were conducted by Centuries Research of Montrose, Colorado. (Chevron 1982m)

Page 3-66, Clear Creek Mesa and Associated Siting Activities

At the end of Section 3.1.1.1, BLM states that recreation areas do not occur within the project area. However, this statement appears inconsistent with Figure 3-1.1-1. Either the text or the map should be revised.

First paragraph: Nearly all of the lands impacted by the proposed reservoir alternatives located in Roan Valley are located on privately owned lands.

Page 3-69, Existing Outdoor Recreation Opportunities

First paragraph, last sentence: Delete sentence.

Page 3-77

The discussion of marriage rates on page 3-77 apparently contains a typographical error. Two separate sets of figures are given for the year 1980.

Page 3-108, Table 3-1-1

Table corrections: Cameo 6600 kw, Shoshone - 14000 kw, Lower Molina - 4860 kw, Upper Molina - 8490 kw.

Second paragraph -- It is stated that "Highway use and capacity for selected road segments are shown in Table 3.13-2." Road segments are not defined but are referenced throughout the transportation discussion. Definitions of road segments should be provided in the FEIS.

Page 4-2, Air Quality

The statement is made that air quality will generally be impacted by the addition of TSP, CO, SO₂, and NO_x. Hydrogen sulfide, reduced sulfur compounds, lead, asbestos, beryllium, fluorides, and radionuclides or other pollutants presence or absence should be included in the FEIS. (See Attachment 3C-4.)

The statement is made that "the accuracy of the results of the Gaussian techniques is generally within a factor of two." Clarify in the FEIS that in complex terrain and high terrain, the accuracy is probably within a factor of 15, therefore, the analyses herein is extremely conservative.

19

Last paragraph -- The description of the models indicates that only preliminary screening modeling of retrofit and upgrading emissions on the mesa has been done. It would be appropriate to reiterate in the FEIS the comment on the conservation of the models (p. 4-2), the fact that they assume operation at 100% of capacity continuously, that time and space are not taken into account in assessing long-range impacts, such as those at Flat Top, and that worst case assumptions are made. The conservation in the modeling leads to over-prediction. The apparent violations of the NO_2 ambient standard and the TSP PSD increments provided for retrofit and upgrading at the Clear Creek property are examples of over-prediction by conservative modeling.

All NO_2 was modeled as NO_x . The FEIS should clarify that without that assumption, which is a very conservative screening assumption, there may be no violation of the NO_2 ambient standard predicted. JAPCA 1991B.12 (1979).

Table 4.2-3 in the FEIS should have a baseline concentration column. Its background numbers may or may not include all other permitted sources. Table 4.2-3 does not contain modeling results for ozone. Hydrocarbon emission numbers are provided for retrofit (Chevron 1982G) and upgrading (Chevron 1982H). There is a high ozone background for this alternative. The analysis that this alternative will not violate the ceiling has been done, and should be included in the FEIS.

Line 12 -- "Receptor N6A" should be "receptor B1A."

The viability analysis for the Clear Creek-100 alternative indicates potential plume dips at Flat Top. The FEIS should state that no regional haze will occur in Class I areas based on Level 1 analysis. This analysis should be explained in air-quality-related value discussion. Lack of significant adverse impact from regional haze within a Class I area or across an integral visit, should be discussed in the FEIS in air-quality-related value section. The analysis of 50,000 barrel per day alternatives notes that "regional haze should not be a problem." The conclusion on regional haze reached for a 50,000 barrel a day level, also applies for the 100,000 barrel a day level.

Acid deposition for the Fruits 1 alternative is analyzed not just for Flat Top, but for Arches National Park, Black Canyon of the Gunnison Wilderness, West

20

Elb Wilderness, and Colorado National Monument. The FEIS should explain the visibility impact of PA-100 and CC-100 on these areas.

In the atmospheric deposition analysis on pages 4-8 through 4-9, the conclusion with respect to Flat Top is that the impact will not lower the levels of these lakes below a value of 6.0 microequivalents per liter and that impact is unknown. Microequivalents should be converted into pH for the FEIS and assess at least classmate in the DDES (4-15,16).

The analysis of the Fruits 1 alternative begins on page 4-9 and continues to page 4-10. Table 4.2-7 (p. 4-10) analyzes the impacts of upgrading at Fruits. The DDES indicates an apparent violation of the 24-hour PSD standard. The concentration predicted the result from the upgrading is 31 $\mu\text{g}/\text{m}^3$. The apparent violation results from the 121 $\mu\text{g}/\text{m}^3$ background number previously discussed (see comment p. 3-5). This apparent ambient violation is discussed in the text at 4-11. We commented on why that number should not be considered a violation. It is disturbing to see apparent violations of standards predicted without any indication that it will be dealt with by mitigation or is likely the result of over-prediction. The FEIS should clarify the analysis and impact.

The air quality analyses of this alternative generally considers the impact of the upgrading facility at Grand Valley and the retrofit at Clear Creek Mesa separately. Their cumulative, overlapping impacts of each facility would reach below the significance level before overlapping, and this justification should be clearly stated in the FEIS. This same comment applies to Tables 4.2-7, 4.2-8, 4.2-9, 4.2-10, 4.2-11, 4.2-12, 4.2-13 and perhaps even 4.2-14. The combined impact of upgrading in Grand Valley and retrofit on the Mesa for viability, PSD increments, and National Ambient Air Quality Standards should be explained in the FEIS.

These FEIS analyses should contain predictions for ozone concentrations that are given in the DDES references Chevon (1982B, C). On page 4-12, it is noted that the upgrade facility will have a minimal impact on ambient maximum ozone concentrations. A similar statement should be made on the impacts for the retrofit and mine.

The impact of the upgrade facility on viability in Arches National Park and Flat Top is made. An analysis of the effect of the retrofit by themselves or in combination with the Grand Valley upgrade facility on Flat Top or on Arches, should be clarified in the FEIS.

21

This analysis in the BLM's Federal Oil Shale Management Program EIS dated January 1983 should be incorporated by reference in the CCSDP FEIS.

The Fruits 1B-30 alternative is nominally a 50,000 barrel per day facility. Table 4.2-16 has been revised and should be incorporated in the FEIS. (See Attachment CC-4.)

Paragraph 1, second sentence -- References impacts resulting from water withdrawals, especially during the low flow periods. The FEIS should clarify that water rights would not be a priority at low flow to present a more realistic description of impacts.

Second paragraph -- On pp. 2-64, under Aquatic Ecology, the DDES indicates there will be a "zero discharge" from the spent shale pile. However, in the second paragraph the DDES indicates that there may be water quality impacts from leachates and surface runoff from the spent shale pile. This should be clarified in the FEIS in view of the "zero discharge" design.

Paragraph 1, first sentence -- This sentence ignores the fact that water quantity, including impacts to other users, is controlled by state law. As stated in our comment on page 3-49 junior flow depletions have a duty to augment downstream flows. Page 3-79 sets forth evidence as to a lack of interaction between the area identified for alluvial ground water withdrawals and downstream flows on Ruan Creek. This should be clarified in the FEIS.

Surface Mine -- All collected surface runoff is not discharged, it is used for dust control. The surface runoff management plan (Moore 1982G), should be more thoroughly explained in the FEIS.

Third paragraph -- The FEIS should clarify the "zero discharge" concept (refer to pp. 4-35 comment above), as it relates to the incineration reactor. The discussion in the FEIS should indicate what magnitude precipitation event the reservoir will be designed to accommodate and that no precipitation will be held in the reservoir. These matters should be related to the statement that a reservoir release may occur during "high runoff" events. An explanation should be added regarding the nature of impacts from the potential high runoff discharges. The plant wastewater treatment system should be clarified in the FEIS (Moore 1982G).

22

The FEIS should clarify quality of surface runoff from the mine site and disturbed areas. Discussion should include contributions present in the soils and other geological materials in the vicinity. For example, the table on page 3-26 contains information regarding the constituents present in processed shale.

Lower Conn Creek dam site is incorrectly sized.

Figure 4.3-1 -- Consider delineating the property line on this map and include Loma.

The identification numbers in this table do not correspond to the numbers of Figure 4.3-1. According to the location these springs and seeps were identified during helicopter flights, however the baseline (Chevron 1982B) indicated ground level contamination.

First full paragraph -- The FEIS should clarify wastewater treatment. The retreating of oil effluent from the treatment plant should be explained. In the second to the last sentence the statement "only possible impacts" should be clarified in the FEIS.

On page 4-38 -- This discussion of wastewater generated at the plant site should be clarified in the FEIS. Explain the type of water treatment that wastewater will receive (Moore 1982G). Explain the basis for the treatment that "water quality impacts on streams would be minimal." The inclusion of any discharge and the nature of any discharge should be addressed.

Third sentence should read: The reservoir could be built under a plan of staged construction.

Prior to the last sentence of the last paragraph on page 4-40 insert in the FEIS the following: "The first stage storage capacity of this reservoir could be reduced somewhat if water from the Ruedi Reservoir is made available to the Clear Creek Shale Oil Project in order to supplement junior water rights when they are not in priority to divert."

Line 3 -- The following sentence should be inserted in the FEIS after the word "diverted": "while these figures represent a worst case withdrawal scenario, the net river depletion estimates shown on page 2-2 (Attachment CC-3) more accurately reflect the Chevron depletion."

23

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Page 4-43, Upper Dry Fork Reservoir

A "worst case" dam breach is extremely unlikely, and the narrative in the FEIS should clarify this likelihood in lay terms to more meaningfully explain it to the public.

Paragraphs two, three, four: The FEIS should clarify that the Colorado State Engineers Office will require specific designated construction criteria to insure dam safety and integrity.

The FEIS should clarify the discussion of the Clear Creek sedimentation reservoir, indicating that surface runoff and seepage flowing through the mine area "could be routed through the reservoir to allow for settlement." This statement sounds as if water will be released from the reservoir after settling. The relationship of this statement to the earlier characterization of this reservoir as a zero discharge facility needs to be clarified in the FEIS.

Page 4-44, Clear Creek Meas...

Second paragraph, last sentence -- Clarify in the FEIS how "significant" will the impacts be for the 100-year, 24-hour event.

Page 4-45, 46, Fruta I Alternative

Clarify in the FEIS any significant water quality impacts different from those discussed in the proposed action including what would happen with wastewater from the Fruta upgrading operation. The diagram on page 2-76 indicates that, with respect to the proposed alternative, wastewater would be used for spent shale conditioning. The upgrading facility is located separately from the retreating and spent shale aspects of the operation, therefore, the disposal of wastewater should be explained (2-41). This matter needs to be clarified in the final EIS.

Page 4-50, Figure 4-4-4

This figure is conceptual exaggerating the exposure of the pile to erosion. Topographic relief figure should be shown in the FEIS.

Page 4-52, Groundwater

The use of the word "adversely" to describe the impact on the alluvial aquifer system, in the first sentence of paragraph 2, is unwarranted given the characteristics of that groundwater water system and the lack of any impact on other uses. We suggest deleting "adversely" from the FEIS.

The paragraph with respect to Plant Site and Ancillary Facilities contains a reference to Table 4-4-3, which should instead refer to Table 4-4-2.

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Page 6-71, Corridor

It is noted that the LaSali pipeline route would affect the West Fork of Parachute Creek. Page 3-45 notes that the hybridized outflow trout is a Colorado endangered species present in the West Fork of Parachute Creek. No impact from pipeline construction and operation would occur on this species. (See comments, 3-42)

Reservoirs

Line 17 -- This sentence should be corrected in the FEIS to say "The operator plan to release water from the reservoir to satisfy senior downstream water rights but at rates not to exceed the inflow from Roan Creek..."

Page 6-72, Reservoirs

The paragraph which begins on page 6-71 and continues on page 6-72 should be clarified in the FEIS. It includes evidence and conclusions of "QOCC" as to aquatic habitat and life in lower Roan Creek. Since Table 3-7-1, page 3-42, indicates there are endangered species in Clear Creek and Roan Creek, the text of the FEIS should specifically indicate their nonexistence in the impact areas of the mine and plant site where the streams will be relocated and below the reservoir where no minimum flows are committed.

Water Supply. The first sentence should be corrected to say, "The water supply system proposed by Chevron includes the use of alluvial and bedrock wells within the Clear Creek property, the use of mesa surface water, as well as..."

Line 11 -- The phrase "but diverting from the Clear Creek headwaters" should be added to the end of the first sentence.

Strike the last sentence of the last paragraph and insert in lieu thereof the following: "Water diverted at the Pitkin Ranch Pumping Plant (see map) goes directly to irrigation ditches or to other replacement locations as required by Colorado Water Law to protect affected senior users."

Page 6-73, Water Supply

The FEIS would provide clarification of the following points:

At the end of the first paragraph add the following: "The U. S. Bureau of Reclamation Supplemental EIS will address in detail the impacts expected to be attributable to runoff water from the Roan Reservoir to the point of diversion from the Colorado River. Impacts from the diversion point on are addressed in this document; the proposed or alternative Colorado River diversions and water delivery mechanisms described herein could be utilized."

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Page 6-61, Reservoirs

First sentence: the total embankment height is proposed at 225 feet.

Page 6-64, Paleontology

Paragraph 4, 5: Identify the locations or delete the reference.

Page 6-69, Aquatic Ecology

There is an incorrect cite to the Endangered Species Act ... it is PL 93-203 (16 USC 1531 et seq) as amended.

Page 6-69, 70, Aquatic Ecology

In a number of instances, the FEIS indicates that the conduct of certain baseline studies and impact analyses and the identification of possible impact mitigation measures have been deferred. We firmly assert that all necessary environmental baseline studies have been provided for the BLM to prepare the EIS. We supplement data collection is needed in any discipline not should such be reflected in the FEIS or in any separate document prepared prior to any final agency action.

Our concerns as to the review of this topic are further expressed in the general comments section. The first full paragraph on page 6-70 underscores the misleading ramifications of using the currently identified "worst case" water withdrawal scenario (see Attachment CC-1, Table 2.1). This section in the FEIS should also reflect the Colorado QOCC recognition of limited aquatic life in portions of the Roan Creek Valley by Class 2 aquatic life designation.

Consideration should be given in the FEIS to segregating the threatened and endangered fish impact assessment from the discussion of the remaining aquatic ecology issues.

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Paragraph 2 portrays significant impacts attributable to water diversions from the Colorado River. This again underscores the misleading current "worst case" assumptions.

Paragraph 3 -- The statements that indicate the unlikelihood of squawfish in the project area, renders the reference to squawfish in paragraph 4 inappropriate. The references in paragraph 5 to the literature and the data gaps contained therein, should be clarified using Attachment CC-1.

Line 13 -- Any estimate of organisms lost should take into consideration storage monthly and annual net depletion for the project under consideration at this time. These CC50-only depletions are provided herewith (Attachment Table 2.1) for the purposes of clarification and should be included in the FEIS along with Table 3-7-2 on page 3-74.

An approximation of an estimated average of 21%, and a maximum of 12%, lost of aquatic organisms from the Colorado River is made, based on uniform distribution of such organisms in the Colorado River, and it is then noted in paragraph 3 that the water would likely increase these losses above proportional losses. This analysis should distinguish CC50P as part of the GDC. This analysis should be refined to approximate an average 7% and maximum 16.5% loss of non-TRE fish.

It is then noted in paragraph 4 that the design does not include any features which would lessen fragmentation or entrainment losses, and in paragraph 5 that "The Colorado River habitat near DeBeque is little used by endangered fish species." The EIS then contains in paragraph 5 the following statement:

"Miller et al. (1982) conclude that the endangered Colorado squawfish spawn in upstream areas and that young squawfish drift downstream. Neither the studies by Miller et al. (1982), nor those sponsored by the GDC, provide data regarding the presence or absence of fish fry which would test this hypothesis as it applies to potential impacts from operation of the DeBeque Intake. The loss of young squawfish downstream DeBeque (Section 3-7.1), however, provides indication that spawning does not occur above the intake location. Concentration of rainbow trout suckers have occasionally been reported in the DeBeque area (Chevron 1983a). However, elimination of backwater habitats in the area reduced numbers found in recent studies to occasional individuals (Chevron 1983a)."

This statement, in the context of the DeBeque diversion intake, seems to be considering the impact of that intake on Colorado River squawfish, indicating spawning upstream and young squawfish drifting downstream past the intake. This is inconsistent with Section 3-7.1, paragraph 3), where the treatment of the Colorado River squawfish is as follows:

"The Colorado River near Lons reports to contain the Colorado River squawfish. Interim-listed endangered species. Recent studies (Miller et al. 1982) suggest that Colorado River squawfish are spawning widely in the area of the Colorado River between Lons and Black Rocks. Individuals have been caught as far upstream as Fairdale, Colorado (Miller et al. 1982)."

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The seeming inconsistency between the baseline section of the EIS and this statement should be reconciled in the FEIS. We assert that there are no squawks in the vicinity as supported by Valdes, 1982. Again, we assert that the data are sufficient in the DEIS for reaching such conclusions.

The actual water withdrawals proposed for the CCSDP project are far less than those on which the 21% and 31% estimates were made. The FEIS should differentiate between the withdrawals for the CCSDP and total GOC withdrawals. This impact statement is only intended to support the permits for the CCSDP and the construction of the Delaque intake structure, not permits for withdrawal by all projects which may be served by the GOC intake.

Finally, the impact analysis concludes that water withdrawals could result in flow reductions to the Colorado River below those critical to the survival of endangered species. This conclusion cannot be supported based on the reduced flows possible from the CCSDP alone (see Attachment GC-3).

Page 4-73, Water Supply

The discussion here regarding diversions at Loma should be clarified in the FEIS. Again, we assume the worst case withdrawal scenario which we raised concerns about earlier. Our aquatic and hydrologic experts have, in the past, questioned the flows referenced on page 4-73 and set forth in Table 4-7-3, see Attachment GC-1. These referenced values should be caveated in the FEIS.

Page 4-74 states that "insufficient information is available regarding operation of the diversion, especially with respect to low flow period and back flushing, to assess the likelihood of achieving the goal of minimum impacts to aquatic biota." This statement is not correct and should be clarified in the FEIS.

Page 4-74, Water Supply

The FEIS should be clarified in accordance with the following comments:

Page 4-75 states that "No site-specific data are available regarding differences in aquatic habitats or species utilization of habitats adjacent to each of four alternative diversion locations near Loma. Without such data, impacts associated with each location cannot be distinguished. It is assumed that all impacts would be essentially the same as those discussed previously for the Loma intake." Such data (Attachment GC-3) do exist and were made available for a critical impact assessment on endangered species from any of the four intakes.

Page 4-77, Water Supply

Line 8 -- The last sentence is meaningless and should be deleted.

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Impacts. Future surveys are offered as mitigation to ensure protection of new populations of such species that may appear in the future.

Alternate Water Intake -- Vegetation

The discussion of the impacts of water intake location upon wetlands near the bottom of page 4-92, should be refined. There is an indication that wetlands may be adversely affected. However, baseline data do not indicate that wetlands so defined by USFWS have been identified. The FEIS should clarify this point.

Wildlife

The Loma B alternative (not Loma C) lies within 0.5 miles of a roost. The Stalmaster reference in Chapter 5 is incomplete.

Page 4-93, 94, Spent Shale Disposal Alternatives

Discussion on pages 4-93 and 4-94 indicate that these sites have been surveyed. To update data additional investigation may take place prior to development in mitigation and belongs in Appendix C-1. The current analysis is an adequate basis to make a choice among alternatives.

Page 4-100, Cultural Resources

Second paragraph -- The discussion of the likely impact of the project on the Canyon Pintado Historic District is confusing. It is unclear from the present text of Section 4.10.1 whether the project is in that region or that region are considered significant. We request a clarification from the BLM.

Page 4-113, Employment, Population and Economic Impacts

Third paragraph -- There is a reference to Appendix B-4 "for communication between the Operator and Battlement Mesa, Inc." Appendix B-4 does not contain this discussion, and this reference should be corrected (see comment on Appendix).

Page 4-113, Employment

Paragraph 1 -- The first sentence should be revised to read "Employment in the two county area would be positively affected by all project alternatives, particularly in the construction, mining, and service sectors." (change underlined)

Page 4-115, 117, Tables 4-12-3

The inclusion of the decimal figures in the tables is potentially confusing. The

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Page 4-75, Vegetation and Productivity

There is a discussion of vegetation and "productivity." An explanation needs to be added to this discussion regarding what type of productivity is being discussed.

Page 4-82, Threatened and Endangered Species

The discussion indicates that more detailed descriptions of potential impacts will be presented in the BLM Biological Assessment and the USFWS Biological Opinion. This statement is erroneous and should be eliminated. Analysis in the Biological Assessment will be based on the same data base as the DEIS and will draw heavily from analysis in the DEIS. In other words, the data in the DEIS are adequate for analysis of impacts in the DEIS. The overall project area has been searched for threatened and endangered species. The DEIS addresses all foreseeable impacts on the species. The FEIS should clarify this point.

Page 4-83, Fruits Alternative

Third paragraph -- There is again a statement that further discussion of potential impacts will be contained in the BLM Biological Assessment and the USFWS Biological Opinion. Again, this statement erroneously suggests that impacts in the DEIS are not fully assessed. Impacts on endangered species are adequately addressed in the DEIS. The Biological Assessment will draw heavily from the data and analysis in the DEIS. The statement that "further discussion of potential impacts..." can not be supported and should be eliminated in the FEIS.

Page 4-92, Threatened and Endangered Species

The FEIS should be clarified in accordance with the following points:

First Paragraph, last sentence -- It is suggested that "for all pipeline routes, right of way specifications would require threatened or endangered plant surveys..." This statement should be eliminated here. We have agreed to conduct pre-construction surveys of threatened and endangered plants as part of mitigation to ensure protection of new populations that may be established in the future. It more properly belongs in 4.11 and Appendix C-1.

Fifth paragraph under Wildlife -- Once again the erroneous statement is made that the USFWS Coordination Act Report and BLM Biological Assessment will provide additional detail concerning potential impacts on these routes. Both studies are utilizing the EIS data and analyses to prepare their own duplicative analyses.

There is a statement that no unavoidable impacts to threatened and endangered plants from pipeline corridors are known for the proposed route, but at the same time there is an indication that future surveys will be required in order to avoid impacts. Again, data used in the DEIS are adequate to assess

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table should be revised to clarify that the figures set forth percentages of the work force residing in specified locations.

Page 4-133, Social Impacts

Last paragraph -- A new sentence should be inserted following the third sentence "These problems are likely to be diminished somewhat by the single state camp and the proximity of the Grand Valley urban area."

Page 4-134, Clear Creek Mesa and Associated Siting Activities

Paragraph 1 -- The first sentence should be revised to read "The loss of rural lifestyle, which has been fading from much of Garfield County for many years, could continue, particularly in the western portions of the County." (change underlined)

Page 4-135, Clear Creek Mesa and Associated Siting Activities

Paragraph 2 -- A new last sentence should be added: "Therefore, even if other oil shale facilities develop within the same time frame, acreage capacity should exist to accommodate the new population."

Page 4-161 through 163, Cumulative Air Quality and Meteorology

The Draft and Final supplemental EIS on the Prototype Oil Shale Leasing Program should be incorporated by reference. The results of the cumulative analysis show violations of Class I and Class II increments under various assumptions. It is a very matter-of-fact analysis. This discussion should be clarified to show contributions of various configurations to increment consumptions. Caveats about TAPPS modeling should be stated.

Page 4-166, Water Resources, Surface Water

The last sentence of the first paragraph is of questionable accuracy since the water appropriation doctrine there water withdrawals should not adversely affect the water quantity available to legally protected users of water. To the extent that junior water right owners are using water and would be called out of priority by the exercise of the senior water rights associated with this project, no legal harm occurs. This clarifying point would better place in perspective the cumulative impact statement referenced above. Similarly, federal and state statutes concerning water quality standards and the water quality standards are established to protect existing beneficial uses. Therefore, there are legal constraints to impairing water quality, compliance with state standards precludes no injury to beneficial users. A discussion of this legal framework would better place any cumulative impact statement of this nature in proper context. Since project water rights are not always in priority, especially during low flow, the use of mean annual flow values in this instance is misleading, see also our comment on page 4-41.

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The second paragraph begins by stating that "Cumulative water withdrawals would impact the available share of water consumption for Colorado." This observation seems to presume that BLM has jurisdiction over water allocation. State water law determines beneficial use and priority of use. This paragraph presents a nonsequitur; the impacts described will occur eventually regardless of who uses the water as users in Colorado develop the remainder of the Colorado allocation of Colorado River water.

Page 4-169, Socioeconomics

The discussion of cumulative socioeconomic impacts is very generic, and could be applied almost anywhere, anytime. It does not reflect the substantial planning, coordination, and infrastructure investment that already exists in this area, nor the fact that the primary area of impact is already very urban.

Paragraph 1, a new second to last sentence should be added: "However, Mesa and Garfield Counties are more urban and better prepared than most of the Rocky Mountain counties which have previously undergone rapid growth related to energy development."

Paragraph 3, sentence 2, should be revised to read: "The kinds of problems occurring during the construction period would most likely be those commensurate with the lifetimes of single state construction personnel."

Paragraph 4, a new last sentence should be added: "Many of the local government and businesses in the two county area need additional population growth to support existing investments in facilities and services."

Page 4-170, Unavoidable Adverse Impacts

As an editorial observation, rather than a "Loss of up to 25,000 acre-feet of water in the Colorado River" is a more accurate statement is "Loss to 25,000 life of the project. Water is a renewable resource and is only utilized for its beneficial use during the operation of the project. Unlike a non-renewable resource, this water source is replenished by precipitation. Even though the shale deposits are not renewable, objection is noted to the use of the word 'loss' in describing the utilization of the shale oil deposits. If the adverse impacts to the threatened or endangered plant species are mitigable, then this issue may not properly be categorized as an unavoidable adverse impact."

Page 4-171, Unavoidable Adverse Impacts

Inclusion as unavoidable adverse impact of \$4-10 billion investment is not an unavoidable adverse environmental impact and should be eliminated from the FEIS. The statement that "Energy use in the development and operation of the project" is not supported in the FEIS since the net energy balance of PL-102 is positive.

32

16

Page 4-173, Air Quality

Under air quality no specific mitigation is proposed, however, it should be required that at all times during construction and operation, CCOOP is required to conduct its activities in accordance with all applicable air quality standards, latest regulations, all required permit applications and reviews conditions for a prolonged period. Consistent with our practices nationwide, we would notify the appropriate agency that upon notification is occurring and operating many units in upset mode.

Page 4-174, Aquatic Ecology

This section should be revised to include mitigation measures identified in general comments.

Page 4-176, Socioeconomics

GENERAL COMMENTS: The proponent has described a MITIGATION STRATEGY, GENERAL APPROACH TO MITIGATION (Planning, Construction, Finance and Community Infrastructure, Transportation, Recreation and Human Services, and Mine Closure) and SPECIFIC MITIGATION MEASURES, GARFIELD COUNTY AREA, MESA COUNTY AREA. These items are described in detail in Section 4.2, Volume III, BLMUE 1982. In order to accurately reflect the proponent mitigation plan, these items should be reprinted in their entirety in Section 4.1.1.1 of the EIS. See General Comments.

Paragraph 2 (p. 4-176), the last sentence should read: "The operator intends to develop more detailed mitigation program with local government officials in order to comply with local requirements at the time of development."

Page 4-177, Land Use, Recreation and Wilderness

The mitigation measures set forth impacts of the project are general. More specific mitigation measures should be included in the FEIS.

pp. 5, Appendices

Ruedi Reservoir should not be eliminated as a water source. Both Chevron and Conoco have applications pending for this water as a supplemental supply.

pp. 5, Appendices A, Other Sources

The first sentence in the description should read "Other major sources which have been or are being considered are:"

33

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pp. 10, Appendices A, Primary Water Systems

A description for Diversion/Route F needs to be added.

pp. 7-1, Glossary of Terms

A list of acronyms and abbreviations would be helpful.

Table C-1-1 Clear Creek Mesa

PS C-1-2

Table C-1-2 Construction & PS C-1-3 Operation - Surface & Groundwater

Reclamation Vegetation is it feasible to maintain flows at Clear Creek Falls? BLM suggests as mitigation the replacement of wells or water. Impact to other water user is a matter of state law to which the BLM should defer.

pp. C-2-3, Appendix C-2

As noted above, this appendix should be reprinted accurately from Section 6.0, Volume III, BLMUE 1982, and combined into section 4.1.1.1. See General Comments.

In addition, E-1.5, Mine Closure, was apparently not reprinted from Vol. III, Section 6.0, and needs to be included.

A new subsection E-1.6, Early Project Closure or Delay needs to be added.

"The overall socioeconomic analysis, and particularly the mitigation strategy described herein, emphasizes operator supports and guarantees for local government at the early stages of the project. This will minimize nonquantified public dissent during this period. Therefore, if the project should be delayed or closed during its early stages, public agencies will not have extensive project related dissent. In addition, this continues its practice of open communication and cooperation to keep agencies as well informed as possible of project plans."

APPENDICES

GENERAL COMMENT: Correspondence from D. R. Loper (Chevron) to Charles Parces (BLM) dated August 13, 1982, and correspondence from Charles Parces (BLM) to D. R. Loper (Chevron) dated September 9, 1982, should be included in the appendices.

34



SOHIO SHALE OIL COMPANY

80 SOUTH MAIN STREET, SUITE 800
SALT LAKE CITY, UTAH 84144
TELEPHONE (801) 228-2000

May 2, 1983

RECEIVED
MAY 3 1983

Mr. Robert Kline
Chevron EIS Team Leader
Bureau of Land Management
764 Scorpion Drive
Grand Junction, CO 81501

Dear Mr. Kline:

Sohio Shale Oil Company would like to thank you for this opportunity to comment on the Chevron Draft Environmental Impact Statement (DEIS).

Sohio, as well as other oil shale companies and industry trade associations (KROCK, etc.) have already commented on other BLM DEIS's which used the same air quality model as BLM used in Chevron's DEIS. To a large extent, those comments are still applicable and should be reviewed again by the BLM; however, I have not repeated those comments here.

In addition to our concerns about the air quality model used, Sohio would like to make the following specific comments:

- On Table 4.2-1, page 4-3, why are total emissions 1988-2001 given for SO₂, PM₁₀, and CO while yearly numbers are given for TSP?
- On Table 4.2-3, page 4-6, BLM should show when impacts exceed standards or increments. Also, the column entitled "Total Conc. Class if (up/cu m)" should be under the "Predicted Impacts" section.
- On page 4-7, A map detailing the receptor locations should be provided with Table 4.2-4.
- On page 4-15, the section on "Atmospheric Deposition" which discusses six sources should be moved to the cumulative impacts section.
- On page 4-21, why does the residential natural gas consumption of 130,000 cubic feet per customer not agree with the 115,000 cubic feet per customer used on page 4-22?
- On page 4-44, under the topic of "Well Field System," the DEIS states that "Impacts on surface stream flows would be negligible." In this because of the volume withdrawn, the time of year withdrawn, or the location of the wells?

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-2-

- * On page 4-44. The last sentence on the page refers to "the stream." Which stream is this?
- * On page 4-161. In the first paragraph under "Air Quality and Meteorology" reference is made to the "Draft Supplemental EIS on the Petrobraya Oil Shale Leasing Program." The Final EIS is now available and should be referenced and used in this section.

Again we appreciate the opportunity to make these comments on this EIS and commend the BLM for its substantial efforts in preparing it. We hope BLM will consider our comments in the preparation of the Final EIS.

Sincerely,

Robert L. Dudak
Robert L. Dudak, Manager
Resource Services and
Community Development

RLD:06



United States Department of the Interior

FISH AND WILDLIFE SERVICE
AREA OFFICE, COLORADO STATE
100 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84103
APR 11, 1983

IN REPLY REFER TO:
MEMORANDUM

To: Chevron EIS Team Leader, BLM
Grand Junction, CO

From: Field Supervisor, Ecological Services
Salt Lake City, UT

Subject: Review of Chevron, Clear Creek Shale Oil Project (CCSOP) DEIS

Subject to your notice of February 29, 1983, we have completed our review of the above document and offer the following comments.

General Comments

We found the Chevron DEIS to be complex (given the large number of project components) and difficult to evaluate in terms of the relative merits of individual alternatives. We believe that the Chevron DEIS does not adequately address wildlife concerns. Impacts to threatened or endangered species, critical bird game areas, migratory birds and sensitive wildlife habitats are acknowledged but not well characterized. Furthermore, the DEIS section on project mitigation for wildlife is seriously deficient.

Although potential mitigation is discussed, there is no commitment to ensure that measures significantly reducing project impacts will in fact be incorporated. Commitment to, or the probability of fulfillment of mitigation measures is required in the final EIS by regulation and is essential if not environmental impacts are to be accurately portrayed.

In the absence of a Fish and Wildlife Coordination Act Report, the FWS recognizes the difficulty of adequately incorporating mitigation measures in the DEIS. We have noted DEIS references to further project wildlife impact assessment and mitigation evaluations through development of a Fish and Wildlife Coordination Act Report and a Section 7 Biological Assessment and Opinion. These reports will provide additional information on the effects of CCSOP alternatives on wildlife and will provide mitigation and compensatory recommendations. We contend that these findings should be fully weighed in the FEIS. In approval of the project, and in selection of final project configurations and mitigation stipulations.

In that committed mitigation for wildlife is essentially non-existent, it is also our position that more substantive commitments for mitigation are needed to satisfy NEPA requirements. We believe that mitigation recommendations to be presented under the Chevron Coordination Act Report (Planning Aid Memorandum) will aid in fulfillment of these requirements. We suggest that report results be addressed in the FEIS. In addition, the Coordination Act Report must accompany

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Chevron EIS Team Leader
Page 2

the FEIS for decision-making purposes. As previously agreed, the Coordination Act Report (Planning Aid Memorandum) is being finalized and will be transmitted to you on or about May 10, 1983.

At this time, a principal concern of our agency is that information to be contained in the Biological Assessment that is vital to development of a Biological Opinion on Chevron's impacts, will not be forthcoming until the fall of 1983. Project destruction of listed plants is identified in the DEIS. Furthermore, there is high potential that water withdrawals from the Colorado River will have adverse effects on state and federally listed endangered fishes. Impact effects on peregrine falcons, bald eagles and black-footed ferrets are also major concerns that are not sufficiently evaluated in the DEIS, but which must be addressed in the Biological Assessment. It must be recognized, therefore, that if an FEIS is prepared prior to completion of endangered species studies, findings of those studies may later influence decision making processes for Chevron's project.

Although we recognize the difficulty of assessing wildlife impacts over large areas, baseline wildlife inventories conducted by Chevron were not consistently performed on all project area lands. This deficiency confounds a determination of the importance of many of those lands to wildlife. The possibility of unforeseen conflicts must be recognized. We therefore recommend that the FEIS include a stipulation for issuance of rights-of-way permits that is contingent on the completion of appropriate wildlife surveys on all lands not adequately covered by original inventories. Areas with deficient baseline wildlife data will be identified in the Coordination Act Report. In addition, basic survey guidelines recommendations will be provided. Data derived from these surveys should be evaluated for potential conflicts through consultations with the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service.

The DEIS identifies many project subalternatives for which wildlife impact assessments are not clearly depicted. An example is found under section 2.3.3, on page 2-38, "Access Roads", which the following statement was made: "An alternate access route to the Clear Creek Mesa Plant site could be built..." (emphasis added). We noted that potential Chevron impacts were primarily evaluated by specific project features (Page 2-61, first paragraph). That is, impact levels were compared between all potential road alternatives (Table 2-4-6), all reservoir alternatives (Table 2-4-8), all rail corridor alternatives (Table 2-4-9), etc. There was no real quantitative or qualitative effort to compare impacts of the proposed actions, for example, both with and without the 16 Road alternative. We recognize that in a project of this magnitude, commitments to the development of all environmental alternatives is formidable. Still the upgrading of 16 Road through the backcountry has a significant bearing on wildlife impact evaluations for project alternatives. For the purpose of more meaningful project impact analyses, the Coordination Act Report will evaluate the potential impacts of each major Chevron alternative and any associated sub-alternatives. Identified alternative components of lesser impact may be recommended as mitigation for some negative effects on wildlife.

Hazardous waste disposal is discussed very briefly in scattered sections of the EIS. The FEIS should list the hazardous substances which will be used or produced by the Chevron oil shale project and the quantities of these substances which are anticipated.

The Project 1 alternative requires relatively long distance transport of raw shale oil to the upgrading facility in Fruita. This increases the likelihood of a spill

Chevron EIS Team Leader
Page 3

of carcinogenic and relatively toxic raw shale oil. The safety precautions and equipment which Chevron proposes to use to reduce this possibility should be addressed.

Specific Comments

Page 2-27. Will Clear Creek be diverted through exhausted underground mine workings by pipe? What are the anticipated effects on water quality if water is diverted through the mine without a pipe?

Page 2-29. Table 2-3-3. If the water requirements for maximum production are 100,000 gpm (13 cfs), can, in the planned water withdrawals from the Colorado River, exceed 300 cfs with an ultimate total storage capacity of 187,000 acre-feet (Luna and DeBour conditions)?

Page 2-30. First paragraph. If Cities and Getty's water requirement can be satisfied by the transfer to Chevron's (46 acre-feet/day), is a reservoir with a capacity of 175,000 acre-feet necessary? The SCC total requirements as stated on page 4-42 of the DEIS are 75,000 acre-feet/year. What water uses are being considered beyond the SCC oil shale needs? Is the total storage of 175,000 acre feet at Odessa and 15,000 acre-feet at Luna really necessary? We believe that justification of this much storage merits discussion in the FEIS.

Page 2-30. Second paragraph. What requirements would necessitate a Big Salt Water Reservoir?

Page 2-30. Third paragraph. What kind of measures will be taken to reduce or eliminate fish impingement or entrainment when water is withdrawn through the intake channel of the Luna intake during low flows? Are larval threatened or endangered fishes likely to be affected during low flow diversions through the channel at the Luna intake?

Page 2-30 and Page 2-30. How much water is expected to be obtained from the Big Salt well and Clear Creek shale systems and what net depletion of Colorado River flow will likely result?

Page 2-30. Worker Transportation. Given the large number of private vehicles that would be used to transport employees to the project site and the potential hazard of big game collision, we believe that a mass transportation system should be required rather than encouraged.

Page 2-30. Material Transportation. To further reduce wildlife collision potential with such a large volume of truck traffic, we recommend construction of the alternative rail line (Page 2-30, Railroad Facilities) for the transportation of coal and other materials.

Page 2-30. Decommissioning and Reclamation. What are the long-term maintenance requirements after decommissioning? For instance, will there be any long-term maintenance of sediment catchment needs, hazardous waste disposal areas, spent shale onleakage and leachate control features and spent shale pile integrity?

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18

Chevron EIS Team Leader Page 4

Page 2-45, Railroad Facilities. Why is a common rail corridor not required to prevent unnecessary adverse environmental impacts?

Page 2-46, Decommissioning and Reclamation. Because there are many subcomponents for each of the alternatives, the amount of acreage disturbed may vary substantially. If 16 Road were not developed as a part of the proposed action, the disturbed acreage would be much less than that of the Frutis I alternative, and would therefore require much less mitigation. Is this justifiable?

Page 2-45 and 2-46, Section 2-3.4.1 and 2-3.4.2, Open-Data Disposal. How can sand and gravel locations be the same under 20,000 and 100,000 alternatives? If the surface mine will not be developed, The Mesa Valley Fill site also may not need 800 million tons of spent shale. Where would all spent shale be deposited if the open pit mine is not developed?

Page 2-51, Section 2-3.4.3, Water Project Configurations. Potential development of alternative project components has a significant bearing on the overall impact of associated major project configurations. Contrary to the statement on Page 2-51, there is no foundation by which the reader or decision makers could reasonably evaluate the merits of all project aspects or the agency preferred alternative. See discussion under general comments above.

Page 2-54 and Page 4-89, Sand and Gravel Operations. We are extremely concerned about the potential extent of sand and gravel removal from Colorado River corridor that would accompany development of Chevron's project. Significant threats to endangered species and riparian habitats may occur as a result of extensive sand and gravel extraction.

Page 2-55, 2-59, Aquatic Ecology. Both intake structures must be designed to eliminate entrainment and impingement impacts to aquatic organisms.

At present, the numbers and species composition of larval fishes that seasonally occur at the Debeque site is unknown. We consider this gap to be a serious deficiency in the analysis of possible impacts to fishes. Again, we suggest that a study of larval fishes in the Debeque area be initiated this field season to enable predictions on impingement/entrainment impacts to the larval fish community.

Page 2-56, second full paragraph, List sentence. What measures are suggested as means of minimizing impacts to LVE plants?

Page 2-58, third and fourth paragraphs, Wildlife. If potential loss or disturbance to water habitats is predicted for LVE alternatives, the proposed action and Frutis I alternatives would have not similar levels of adverse impacts. Indeed, the Frutis I alternative would cause significantly greater impacts on the same wetlands. Bald Eagles are listed as endangered in Colorado, however, the Southern screech owl is not known to occur in the area.

Page 2-58, Section 2-59. What alternatives exist for Frutis I spent shale disposal if 1/2 plants are found in the four identified spot areas? The Mesa Valley Fill may affect more than 1600 acres depending on the approval of 50,000 or 100,000 BPS alternatives.

18

Chevron EIS Team Leader Page 5

Page 2-56, Wildlife. The Mesa Valley Fill will affect grass prairie that may be utilized by migratory birds of high Federal interest. Recent FWS/COW information indicates use of riparian by wading birds to the north of the fill site. The Mesa Valley Fill. The Mesa Valley Fill will also destroy cliffs in Willow Creek which house several golden eagle nests. Destruction of golden eagle nests is subject to regulations of the Eagle Protection Act, and may or may not be permitted depending upon specific circumstances and conditions at the time of permit application.

Page 2-57, Vegetation. Why are impacts to 7/5 plants by construction of access roads unavoidable? If such roads are unavoidable, how can the assessment of impacts on the Roan Creek corridor be considered anything less than extremely adverse?

Page 2-59, Wildlife. The potential effects of major road construction through critical big game ranges is seriously aligned. The effects on area big game populations by simultaneous development of two major access corridors (as may occur in either the Proposed Action or Frutis I alternative) are not addressed.

Page 2-59, Recreation. We agree that increased access has some beneficial value. However, compounded effects of both project-related habitat destruction/disturbance and increased non-Chewron human activity may further threaten big game populations and sensitive wildlife species. These considerations must be weighed in making corridor permit applications.

Page 2-70, Aquatic Ecology. The EIS states that the diversion design at Debeque does not mitigate anticipated significant losses of aquatic biota which have been estimated at 33 percent locally. Why has a design modification not been considered in lieu of data on the composition and relative abundance of larval fishes? We contend that intake design modifications or complete redesigns are essential and must be stipulated as a permit condition.

Page 2-71, Wildlife and Page 2-80 to 2-85, Materials and Motor Transport. While a railroad from Debeque to Upper Grand Wash may have some negative effects on big game winter ranges, we believe that the impacts of the railroad would be less than transportation alternatives using heavy materials and motor transport. Big game transportation needs reflect only truck traffic required to haul coal and limestone. There would be no need for a railroad to transport materials or other materials as well. Coupling heavy truck traffic with some 3600 employee vehicle trips/day without some means of mitigating negative wildlife impacts is not acceptable to the FWS. We strongly recommend adoption of a rail system for transportation of raw materials. We further recommend that the feasibility of utilizing the railroad to transport artwork be examined. One further point, we do not believe that truck noise would exclude wildlife from road corridors.

Page 2-82, Recreation. See above comments for Page 2-80.

Page 2-85, 2-86, Air Preferred Alternatives. References are made that impacts to air quality, land use, biological resources, etc. are within acceptable limits. More detailed impact considerations, including a favorable design for project development and were there specific qualifiers used to determine

18

Chevron EIS Team Leader Page 6

"Acceptable limits?" Where agency obligations under the Endangered Species Act considered in choosing a preferred alternative?

Page 3-41, paragraph 1. Adult Colorado squawfish are captured routinely as by-catch in the Debeque area and in 1989 spawning was confirmed in the reach between Fallside and the confluence of the Gunnison River by the presence of larval squawfish.

Page 3-41, Table 3-7-2. Columns under Historic Status and Status categories should be transposed.

Page 3-47, fourth paragraph. Information available in Chevron baseline studies (1981) (2) indicates that additional golden eagle nests have been located. This new current information should be addressed in the final EIS.

Page 3-57, fifth paragraph. Colorado Division of Wildlife data suggests that the Colorado River around Debeque is an important winter bald eagle concentration area.

Page 3-55, sixth paragraph. Given the limited extent of baseline wildlife data obtained for the Mesa Valley area and given recent probable sightings of black-footed ferrets in the region, the potential occurrence of ferrets on or near Chevron project lands cannot be discounted and requires further assessment.

Page 3-56, Atmospheric Conditions. As acid is added to a lake, there will be little change in pH until 80 to 90 percent of the buffering bicarbonate has been consumed. The lake will become acidic as the rate at which acid is added exceeds the rate at which geochemical weathering processes produce bicarbonate.

We presume that the statement on Page 4-9, lines 12 through 14, means that the existing alkalinity will not be reduced by more than 6 meq/l total throughout the life of the project. How was this figure determined and on what assumptions is it based? Also, do Chevron's calculations assume an acidity for snowmelt?

Page 4-42, first two paragraphs. Quantified demands in the Lower Colorado River basin indicate attributable to all projects are estimated to average 302,000 (Nov. 82) cfs) annually for each mgd increase in upper basin. Demands in the upper basin and in Mexico have not been quantified. The United States has an agreement with Mexico to deliver relatively 100 mgd/year salinity impact from Chevron's operation would completely negate the 15.2 mgd/year improvement from the proposed Lower Sonoran Salinity Control project which will cost \$1.6 billion.

Government salinity control projects will result in loss of wildlife habitats, much of which will remain unmitigated. If salinity control projects must make up for Chevron's salinity impact, both additional government expenditures and loss of wildlife habitat will result to the extent of the 100 mgd/year salinity impact from Chevron's operation would completely negate the 15.2 mgd/year improvement from the proposed Lower Sonoran Salinity Control project which will cost \$1.6 billion.

Based on the above figures and the estimates on Page 4-42 of the draft EIS, a 17.23 mgd/l increase in salinity represents 512,095,460 of damages. The yearly

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Chevron EIS Team Leader Page 7

figures of 1.6 mgd/l for the CCSP and 4.8 mgd/l for the CCSP joint venture represent damages of \$1,123,200 and 13,960,800 respectively, totaling \$4,48,800. Please clarify if the 17.23 mgd/l figure is a worst case yearly figure.

We can find no discussion in the DEIS relating to any intent to mitigate for either the construction or wildlife habitat losses. Does Chevron propose to mitigate for increased salinity and associated costs to others?

Page 4-43, third paragraph. The EIS indicates that the channel below the Roan Creek dam site could be degraded due to the increased activity of the stream flow. If uncontrolled, this could result in a deeply incised, steep walled channel of reduced width to wildlife. What measures does Chevron propose to control bank-cutting and channel degradation?

Page 4-71, last full paragraph. Adverse effects on water quality downstream of the Roan Creek Reservoir could be largely ameliorated by installing multi-level canals and assuring intense fines filtration to support existing riparian vegetation and fisheries.

Page 4-72, second paragraph. With a superficial calculation of likely water withdrawal levels from the proposed Roan Creek Reservoir, it appears that the reservoir could indeed support a fishery.

Page 4-73, paragraph 3, 3 and 4. Same comment as for page 2-55, Aquatic Ecology, re: larval fishes.

Page 4-73, paragraph 5. Razorback sucker bio-logy in the Upper Basin is poorly understood, and since the population around Debeque has not been intensely studied, the importance of that area is unknown. The razorback sucker is listed by the State of Colorado as endangered species and is a candidate species for Federal listing.

Page 4-73, paragraph 5. There must be some consideration given to lessening the impacts of impingement and entrainment. The scale of mitigation measures would depend upon the degree to which the intake is modified. We believe that due to a failure to study the larval fish community and drifting macroinvertebrates. (See comment on Page 2-50 and 2-70). Design features such as traveling horizontal screens (impingement) or passive intake screens (entrainment) may offset impacts on aquatic organisms.

Page 4-73, fifth paragraph. "No features which would have lessened impingement or entrainment have been incorporated into the Debeque design to date."

Comment. State and Federal listing of 7/5 fishes may affect in the vicinities of both Chevron facilities. The importance of the intake areas to listed fish will be directly impacted through entrainment or impingement. We believe that due to the level of likely impacts, the Debeque intake on aquatic biota is unacceptable. The strategy utilized to reduce or eliminate impingement and entrainment problems. The effects of Chevron/CCSP water withdrawal on downstream aquatic habitats is perhaps, our agencies greatest unmitigated concern.

Chevron EIS Team Leader

Page 5

Page 4-76, first sentence. What are the responsibilities of Chevron in repairing and/or compensating for failures of spent shale reclamation after the project is completed?

Page 4-76, third sentence. Would the design for a Low Intake be the same regardless of the final selected intake site?

Page 4-89, third paragraph. As Cooper's hawk nest in trees and may periodically on birds. Impacts to this species will be associated with destruction or disturbance of aspen groves, coniferous forests and riparian habitats.

Page 4-89, fourth paragraph. The last sentence of this paragraph obviously references regional population considerations in proposed regulatory changes of the Eagle Protection Act. It must be noted that the criteria used in determining the bounds of a "regional population" of golden eagles has not yet been determined. Almost certainly that "area" will be much less than northwestern Colorado and will consider potential cumulative effects on "regional or area" eagle populations.

Page 4-92 to 4-97, Endangered Species. Because all project area lands were not surveyed for listed plants, the potential existence of T/F plants in non-surveyed areas should be a consideration in the development of right-of-way permit stipulations. Further surveys should be performed prior to the permitting of any disturbance. Chevron baseline raster surveys were not performed with sufficient intensity or at sufficient times to provide reliable data on the potential existence of riparian fish species. In addition, we do not believe that the instability of cliff ledges is legitimate argument against habitation of the Clear Creek area by peregrines. Golden eagles appear to be doing relatively well on Clear Creek area cliffs. The occurrence of golden eagles would more likely be limited by cliff instability than would peregrines which have a documented history of nesting in "inferior" locations. (also refer to comment on page 3-85).

Page 4-99, wildlife. The potential effects of the PH-80 alternative on big game and patterns depends on the extent of spent shale disposal. Again, we question the ability of the Hesse Valley Fill site to contain 800 million cubic yards of spent shale.

Page 4-99, wildlife. The comment above applies to the CC-50 alternative as well.

Page 4-99, wildlife, second paragraph, fifth sentence. Statement not appropriate - see above comments for Page 4-58 of DEIS.

Page 4-99, section 4.8.4, second sentence. Impacts to riparian habitats and aspen should be considered significant.

Page 4-99, wildlife. In terms of habitats utilized by wintering bald eagles in Colorado, stretches of the Colorado River near project sites are extremely important. Roost sites have been identified near the Deltone Intake.

Page 4-99, wildlife, second paragraph, second sentence. See above comment made for information presented on Pages 3-82 to 3-85 on the DEIS.

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18

Chevron EIS Team Leader

Page 9

Page 4-95, Secondary Impacts, Wildlife. The secondary effects of Chevron's development on wildlife is a topic which should be addressed. Impacts are difficult to measure, the resultant effects on terrestrial wildlife may be greater than those of the project itself.

Page 4-95, Cumulative Impacts. We don't believe that the criteria used to select project for cumulative impact evaluations are reasonable. It is our opinion that cumulative impact evaluations presented in the DEIS are inadequate. At the very least, the potential consequences of all planned oil shale operations in western Colorado and Utah should be considered. In addition, existing and proposed major consumptive uses of Colorado River water should be identified and evaluated.

Page 4-95, Mitigation, wildlife paragraph. Because Chevron's project constitutes a major federal action, it is our opinion that mitigation of non-federal lands can be required for adverse impacts attributable to the project, particularly when those impacts affect public resources.

Page 4-95, last paragraph. Again, development of an appropriate intake design to protect aquatic biota must be a permit condition.

Page 4-95, Wildlife. A "draft" mitigation program reviewed by FWS included mitigation alternatives which have been deleted from the DEIS. We believe that these alternatives represented potentially favorable mitigation considerations which should be included in the FEIS.

Page 4-95, Appendix C-1. Committed wildlife mitigation in this appendix is poorly representative of wildlife mitigation needs for a project with such diverse, extensive and intensive wildlife impacts. More appropriate levels of mitigation will be recommended in the Wildlife Coordination Act Report.

Summary

The FWS has three major concerns over the CCOP - DEIS. These are:

1. Data gaps in baseline fish and wildlife information (particularly rapists and threatened and endangered species.)
2. Lack of committed mitigation features to reduce recognized adverse impacts. And
3. Completion of the final EIS prior to the availability of a Biological Opinion to adequately assess project impacts upon threatened or endangered species.

These concerns reflect serious deficiencies. However, the FWS believes that they can be ameliorated or dispelled in the FEIS. Should this not be possible, we may have no choice but to seek referral to CEQ. We therefore recommend that the FEIS:

1. Recognize the need for and ensure that pre-construction fish and wildlife surveys will be performed on areas where the existing data are lacking.

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19

Chevron EIS Team Leader

Page 10

2. Includes a committed plan of mitigation to significantly reduce adverse impacts to fish and wildlife resources. Such a plan should fully consider the recommendations as set forth by Fish and Wildlife Coordination Act findings and be consistent with existing FWS, NRE and CSD regulations.
3. Provides recognition that both BLM's Biological Assessment and the subsequent USFWS Biological Opinion must be completed and their findings considered before any final decisions regarding project permitting.

The FWS will continue to work closely with your agency and the project proponents toward resolving issues identified in our DEIS review. It is our intent to help provide an FEIS which adequately addresses fish and wildlife interests in the project area.

cc: COW, Denver, Grand Junction
SCL, Hargett Jallen, Denver
LSD, Golden

RICHARD J. LAMM
Governor
2788



JERRY A. DANIELSON
Commissioner

OFFICE OF THE STATE ENGINEER
DIVISION OF WATER RESOURCES

1315 Shennett Street, Room 818
Denver, Colorado 80202
(303) 866-2643
April 19, 1983

MEMORANDUM

TO: Adam Fox, Department of Natural Resources
FROM: Kai B. Slego, Assistant State Engineer
SUBJECT: Draft Environmental Impact Statement (DEIS), Clear Creek Shale Oil Project

As requested, we have reviewed the above referenced DEIS. We feel that in general the DEIS is both clear and sufficiently detailed for this level of evaluation. Earlier, we commented on the preliminary DEIS. The DEIS responded that several of our comments were outside the scope of the DEIS. We feel, however, that without new responses to these issues that the impact of the proposed project will not be fully disclosed. We therefore, are repeating some of our earlier comments in the concerns we list below.

1. We realize water rights junior to the GOC (Deity, City Service, and Chevron) resource system may be called out to benefit project demands. What would the impact be on other water users in the basin if this call should occur?
2. What will be the impact if significant agricultural water rights are converted to mining purposes?
3. Augmentation plant should be included as a viable mitigation measure in Appendix C of the DEIS. The DEIS should also commit to the approval of how water rights will be protected during the construction of various corridors.
4. The DEIS states that significant impacts are likely for springs emanating from the mesa top. What impact, if any, will there be on the users of springs in the area? How does the operator propose to mitigate any injurious that may result?
5. On page 3-39, existing well permits in the area of the project are listed. It is important to realize that not all existing wells have permits to draw water. Some wells may be constructed before well permits are required. Do any unpermitted wells exist near the project area, and if so, what will be the impact of the project on these wells?

19

Adm. Div.
April 18, 1983

Page 2

6. What will be the resultant change in runoff characteristics and in the ground water hydrology of the project area after mining is completed?
7. We would like to make the following editing corrections on page 1-5:
 - a. under Division 5 Water Court: delete the word "and";
 - b. under Division of Water Resources: change the word "and" to "up" and make the following addition "up have the capacity of more than one thousand acre-feet."

HDM/288:ms

cc: Les Enlow, Div. Eng.

STATE OF COLORADO



Richard D. Lamm
Governor
Lillian McQuade
Lieutenant Governor
David M. Butler
Secretary of State

COLORADO WATER CONSERVATION BOARD
Department of Natural Resources
800 West Colfax Building
1715 Sherman Street
Denver, Colorado 80202
Phone: (303) 866-1001

MEMORANDUM

TO: Adm. Div.
Program Director, Joint Review Process

FROM: Dan Law
Assistant Section Chief
Hydrologic and Interrelated Streams
Investigations Section

DATE: April 8, 1983

SUBJECT: Clear Creek Shale Oil Project DEIS

We have reviewed the subject report and offer the following comments:

1. Page 2-3 - Ruedi Reservoir should not have been eliminated due to uncertain water rates and delivery schedules. The water rates would be similar to the existing contract or at least this assumption could be made for comparative purposes. Water from Ruedi could eliminate the need for one or more reservoirs on Roan Creek.
2. Page 2-28 - The water requirement value for domestic use listed in Table 2.3-7 is 23 acre-feet per day. At 260 gallons per capita per day, this would serve over 37,000 people. Does this value accurately reflect your population projections?
3. Page 2-29 - The water rights narrative should include a yield analysis of the project rights.
4. Page 3-12 - The information on this page is confusing because several different references are used. The virgin flow, water depletions and compact allotments should be derived from up to date Bureau of Reclamation studies and the salt loading and salinity concentration rate should be derived from up to date Bureau of Reclamation, Soil Conservation Service, Bureau of Land

525
(80/8)

C of Interest: Road, Gas, Coal, Cattle, Sheep, Salmon, Trout, Wildlife, Forest, Fish, Game, Deer, Rabbit, Squirrel

20

MEMORANDUM

-2-

April 8, 1983



COLORADO STATE SOIL CONSERVATION BOARD
615 West General Building
1212 Sherman Street
Denver, Colorado 80202
Phone: (303) 866-1001

Richard D. Lamm
Governor

Allen J. Campbell
Director

MEMORANDUM

TO: Adm. Div., Program Director, Colorado Joint Review Process

FROM: Steve Hart, Acting Director

DATE: April 8, 1983

SUBJECT: Clear Creek Shale Oil Project DEIS

We have reviewed the above DEIS and submit to you a number of comments associated with the soils and land use aspects.

Our comments are based on the selection by BLM of the Prudis I configuration at the 100,000 bbl production rate as the agency's preferred alternative. This alternative would appear to have the most severe impacts on soil erosion and land use of all the possible alternatives. These impacts are shown by Table 4.1-1.1 which indicates a total of 31,182 acres affected. Also, Table 4.1-1 shows a 370% increase in soil erosion and the loss of 80 acres of prime farmland.

Most of the cropland in the project area is located in the valleys. Yet, these valleys will be subjected to abuse due to the onset of construction of pipelines, transportation systems, and future housing projects. A total of 11,181 acres are shown to be impacted, but the most pressure will be on the small number of acres of cropland and pasture in the valleys. There is no natural available to create new farmland to replace those acreages lost due to the proposed project. Agricultural use of the land should not be sacrificed for the development of the oil shale project.

If you have any questions on these comments, please feel free to give me a call.

bb

21

Adan Poe
April 8, 1983
Page 2

Based on the above concerns, we would have to disagree with BLM with their selection of the India I configuration at the 100,000 bpd production rate. The Clear Creek configuration at the 100,000 bpd production rate would appear to be a better alternative. The damages to and losses of the agricultural land are considerably less with this alternative.

DNW/vaw

21

STATE OF COLORADO
RICHARD G. LAMM, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
Jack R. Smith, Director
6000 Broadway
Denver, Colorado 80202 (303-833-1102)

22



April 18, 1983

TO: Steve Ellis
Colorado Clearinghouse

FROM: Al Whitaker
Wildlife Program Specialist

RE: Clear Creek Oil Shale Project, DEIS

This agency is involved in an extensive computer-assisted analysis of the proposed project and its alternatives. These will be included in a Fish and Wildlife Coordination report to be produced by the U.S. Fish and Wildlife Service.

Needless to say, the document is very technical and the project covers a great number of different wildlife habitats. The tremendous size of the project will indicate that tremendous impacts will be exerted on the State's wildlife resources. Many of these impacts can be substantially mitigated but we note that the only omitted mitigation appears to be installation of buffers on trunks. We cannot believe this meets the NEPA requirement for mitigation, and recommend that preparation of the final EIS be held up until the Fish and Wildlife Coordination Act report is finalized.

APV:jh
cc: P. Stone
File

DEPARTMENT OF NATURAL RESOURCES, Monto Passes, Executive Director WILDLIFE COMMISSION, James T. Smith, Chairman
Richard Smith, Vice Chairman, James C. Gentry, Secretary, John Smith, Member, Charles H. Heston, Member
Michael Hughes, Member, Arthur Heston, Member, John K. Tapp, Member

23

STATE OF COLORADO



HOWARD G. LAMM
GOVERNOR

JOHN W. HOLE
DIRECTOR

COLORADO GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES
170 STATE CENTENNIAL BUILDING - 320 S. GERMEN STREET
DENVER, COLORADO 80202 PHONE (303) 833-3111

MEMORANDUM

TO: Adan Poe, Program Director, Joint Review Process, Dept. Natural Resources

FROM: L. R. Laddis *LR*

DATE: April 12, 1983

SUBJECT: Clear Creek Shale Oil Project DEIS

We have no comments at this time. This DEIS appears to cover all of our concerns and areas of interest.

L. R. L.

bn

24



DEPARTMENT OF NATURAL RESOURCES

MINED LAND RECLAMATION DIVISION
DAVID C. SHELTON, Director



April 11, 1983

TO: Adan Poe, Joint Review Process

FROM: David C. Shelton *DS*

SUBJECT: Clear Creek Shale Oil Project DEIS

We have reviewed the DEIS for the Clear Creek Shale Oil Project prepared by the US Bureau of Land Management. Due to the large size of the document and limited staff time, our review was general in nature. We believe that the DEIS does adequately cover the general issues related to an oil shale project of this size and character. It does not, and probably should not, deal with issues at the detail level which we will require during our permitting process. The level of analysis provided by the DEIS, however, does allow for adequate comparison of alternatives and general disclosure of the environmental issues related to such a project.

For the above reasons, we believe that this DEIS is adequate and acceptable, and we congratulate the BLM for succeeding in such a major task.

/sds

25

DEPARTMENT OF NATURAL RESOURCES
EXECUTIVE DIRECTOR'S OFFICE
1312 Sherman Street, Room 715
Denver, Colorado 80202
866-3337

MEMORANDUM

TO: Adam Poe, Joint Review Process
FROM: Executive Director's Office Staff
DATE: April 28, 1983
SUBJECT: Clear Creek Shale Oil Project DEIS

Outlined below are additional miscellaneous comments on the Clear Creek Shale Oil Project Joint Environmental Impact Statement.

Page 1-3 The first CDP-Town meeting was held in Rilea, September 16, 1981 not September 19.

Figures 2.3.3-4 These Alternative Project Configuration maps should be revised to reflect the fact that shale oil separating and retorting will not be conducted simultaneously at the Frisco plant site and at the Clear Creek Mass site.

Page 2-34 The discussion of solid and hazardous waste disposal that begins on this page and is continued throughout the document is absolutely at best, an inventory and characterization of the hazardous wastes to be generated is not included nor is there any indication of the volume of hazardous wastes requiring disposal. Such information is essential for a complete analysis of the potential impacts of the project. The DEIS cites off-site and on-site disposal of hazardous wastes as possible alternatives. However, there is little evaluation of these alternatives. There is also little analysis supporting the statement on Page 2-34, "At this time, on-site disposal (of hazardous wastes) seems most viable." Finally, there is little or no discussion of hazardous waste disposal in the cumulative impacts analysis discussion.

25

Adam Poe
April 28, 1983
Page Three

This "negligent" land use change would change this area's use from open space to industrial use for over 150 years. Such held statements are unwarranted.

Page 4-107 The comparison of wilderness areas to developed playgrounds in communities is farcical.

Page 4-161 By and large, the section on cumulative impacts is weak and of marginal value. From the material presented it is difficult to determine the contribution of each project to the cumulative regional environmental quality. This section deserves a greater amount of effort, especially given the substantial interest in cumulative impacts expressed during the scoping process.

Page 4-170 25,000 acres-feet of water from the Colorado River will be used on an annual basis. This distinction should be made.

Pages 4-171-2 Many of the items listed under Irreversible and Unrecoverable Commitments of Resources are also shown under the short-term category under the Relationship Between Local Short-Term Uses of Men's Environment and the Maintenance and Enhancement of Long-Term Productivity. This is inconsistent and should be changed.

Page 4-172 Changes in land use patterns are most definitely long-term.

25

Adam Poe
April 28, 1983
Page Two

Page 2-74 The land use section contends that the development of any of the alternative reservoir sites in the Bone Creek drainage would be beneficial. This statement needs to be substantiated given the fact that the reservoirs as discussed later in the document will be subject to substantial fluctuation limiting their use for any recreational purposes or as a stable aquatic habitat. The "diverse land uses" alluded to on page 2-74 should be discussed.

Page 2-79 Table 2.4-10 regarding forest comparisons of product transport consider alternatives should include consideration of land use impacts.

Page 2-82 Under worker transportation, the assumption is made that worker transportation impacts under the "50,000 BPD alternative" would be about half of those for the 100,000 BPD alternative. This assumption appears to be erroneous upon the average annual employment figures provided in Table 4.11-1. This table shows that through 1993 (or the first nine years of the project) that total project employment for the 100,000 BPD and 50,000 BPD Clear Creek Mass and Frisco alternatives would vary only slightly.

Page 2-83 Reference is made to the need to transport 8,500 TPD of coal and lignite. The discussion on page 2-81 only mentions moving 4,500 TPD of coal. How much lignite will be required on a daily basis?

Page 4-71 The statement is made that releases from the reservoir will not maintain minimum stream flow for existing aquatic biota. The impacts on the aquatic environment below the reservoir should be assessed to a greater level of specificity.

Page 4-84 Reference is made to the passage of 30 trucks per day within the Clear Creek access corridor. On page 2-34 reference is made to 450 trucks per day. Please clarify.

Table 4.11-1 This table does not make a distinction between various types of agricultural lands (i.e., irrigated, cropland, orchards, etc.). Such a breakdown would provide a more accurate reflection of the land use impacts.

Page 4-108 The statement, "Although there certainly would be a change in land use characteristics from open space to industrial, the change would be insignificant" is highly subjective and debatable.

26

COLORADO DEPARTMENT OF HEALTH
Richard D. Lamm, Governor
Frank A. Taylor, M.D., Executive Director

April 21, 1985

TO: Department of Natural Resources - Joint Review Process
FROM: Health Department - Air Pollution Control Division
RE: Clear Creek Shale Oil EIS/Chevron EIS

The Air Pollution Control Division has reviewed the air quality and resource-allocation sections of the Chevron EIS. We would like to forward the following comments to BLM in anticipation that they will be considered in the Final EIS.

Chapter 1 (and Appendix 8-1)

The numerical impact rating system is really not appropriate in the case of air quality. Assigning unproved weighting factors (BOD construction, 20% operation, etc.) does not appear to be valid, since a violation of an air quality standard is just as serious during construction as it is during operation. Air quality impact comparisons would be better presented with the use of numerical values directly related to air quality units of micrograms per cubic meter or in terms of percent increment consumed.

Chapter 3

Background values selected should be justified; the values appear to be low in the case of TSP, SO₂ and CO. The Division's records of Frisco's TSP values show them to be higher than values reported on page 3-6. In addition, ozone concentrations should have been included in table 3.2-3, page 3-6.

Chapter 4

Construction activities produce some of the highest fugitive particulate emissions and, therefore, should not be excluded from overall impact assessment as was stated on page 4-2. Construction activities should be considered separately, since they usually do not occur at the same time as operational activities. Because particulate PM10 increment limits are reported on table 4.2-4 are being approached (31 µg/m³ estimated, compared with a 37 µg/m³ standard), and the construction is coming largely from fugitive sources, omission of these fugitive sources seem inappropriate.

All pollutants which are subject to a BACT (including NO_x) should be identified and a summary of the applicant's BACT determinations should be included. The BACT summary should include a consideration of energy impacts, economic impacts and environmental impacts. The Chevron DEIS references the PSD air quality submittal when referring to emission estimates. A review of the PSD submittal shows that the BACT review generally incorporates analyses of energy and economic impacts, however, the impacts to the environment which would be realized by different levels of control are not discussed. The Division believes that levels of control for sources of air pollutants should include this environmental impacts analysis. Specific air quality related impacts that should be addressed are the reduced impacts on visibility and acid deposition which could be realized through more stringent controls for sulfur dioxide and oxides of nitrogen.

The Division is especially interested in the visibility issue, since it is stated on page 4-8 that "visibility impacts predicted by the modeled plume were found to be significant for both lines of sight under two cases" (Slair Lake and Big Marjorie lines of sight). The Division would like to see an evaluation of visibility impacts in both Class I and Class II areas, not just Class I areas. Secondly, the analysis should identify the pollutants that are contributing to the visibility effects and the technology options that are available to address the identified emissions. Finally, a comparison of the cost of control to the benefit realized from reducing the visibility impact should be provided.

In conjunction with the BACT analysis, the emission rate tables located throughout the chapter should list the type of control equipment employed, and the respective control efficiencies.

A. Clear Creek Head (p. 4-3 to 4-9)

The impacts from mining, retooling, and upgrading should be combined to give the total project impact for each of the major pollutants: SO₂, NO_x, and TSP. A map with isopleths of particulate concentrations along with a table giving the maximum resultant concentration would be the most effective way of presenting the results.

The NO_x emissions from the surface and underground mines were not modeled.

There is no mass analysis for this scenario. Since the high background concentrations found at the Mesa site (page 3-5), this analysis will have to be done.

B. Grand Valley (p. 4-9 to 4-23)

The scenario analysis should have included an air parcel trajectory, starting at the upgrading facility in Grand Valley, and moving over the resort and mining facilities at the Mesa site.

C. Cumulative Analysis (p. 4-181 thru 4-185)

The method and assumptions used in the cumulative impact modeling, such as wind stability, wind directions, and model were used, should be described in more detail.

There is no cumulative analysis for impacts at Colorado National Monument National Monument. It is a Colorado Category I area and, therefore, a sensitive receptor. The Division will be interested in seeing the results of this modeling, especially after such high concentrations due to the upgrading facility found at Mesa (page 4-13).

There is no cumulative ozone analysis. A reasonable air parcel trajectory should be modeled. A possibility is one beginning at the southeast power plant, then including both Chevron facilities, the union project, and, finally, the Solway project, which should be included in the cumulative air analysis.

For scenario 4, 1-1, page 4-16, we would recommend using PSD permit emission inventories wherever available.

With regard to table 4.14-2, it is not clear if cumulative impacts on Class I areas -- Ross Cliffs and Grand Hogback -- include background. It is also not clear which Chevron production and refining scenario is used, and which scenario constitutes worst case. On the same table, the definition of footcandle b and c should be reversed.

It would be very beneficial to include a comparison of air quality impacts for each of the seven alternatives considered.

Finally, the Division notes with concern the absence of a malfunction and upset control air quality impact analysis, which would be included as part of the adverse environmental impact analysis by the proposed alternative in the DEIS. Malfunction/upset analysis should include those accidents and equipment failures which would be the experience of the developer, a relatively high probability of occurrence. The analysis is not intended to cover catastrophic failures and site should not be limited to the release of pollutants from such design features as flares, pressure relief systems, etc., which are already included to protect equipment. Rather, the analysis should address the anticipated number of upset/malfunction occurrences per year, the resultant emissions, and the effect of these emissions on air quality. Along with the air quality impact, a statement of hazard significance should also be provided with each type of malfunction or upset analysis to include as a minimum such indicators as imminent danger, non-serious, or de minimis possible effect on public safety, health, or welfare.

Thank you for this opportunity to comment. If you have any questions, please call Alan Brasser or John Plog at 330-180.

WJL/ma

COLUMBIA DEPARTMENT OF WATER

Division of Surface Waters

Water Management Division

WATER-USE/CONSTRUCTION

TO : Paul Perreault and Ken MacIsaac

DATE : April 15, 1985

FROM: Red Hook

SUBJECT: Clear Creek Shale Oil

Fracking Unit

This memo comments on discussions of environmental and hazardous waste disposal in the subject DEIS. Waste disposal issues are discussed for the following scenarios:

1. On site disposal at a surface site in upper Clear Creek (the Mesa Valley Fill site) and in the sand used open pit, for a 100,000 bbl. facility with retooling and upgrading on site at near Frisco (also on Clear Creek property).
2. On site disposal at the Mesa Valley Fill site only for a 50,000 bbl facility with retooling and upgrading on site at near Frisco (also on Clear Creek property).
3. Off site disposal at one of four sites near northwest of Frisco for a 50,000 bbl facility with retooling and upgrading near Frisco on Clear Creek property.

The Mesa Valley Fill site and the mine would be exempt from certification of destination requirements (Certified Country) because they would not be subject to RCRA permit requirements. They would not be required to meet department waste disposal regulations for the mine reason. The off site facility proposed for scenario 3 would require certification of destination from either Mesa or Grand County, depending on the site chosen, and would have to address hazardous and nonhazardous waste disposal.

The DEIS does not show hazardous wastes will be generated by retooling and upgrading. The only reference to hazardous waste disposal is a cryptic one saying on page 4-13 that "the proposed alternative for the Mesa Valley Fill site disposal at an 'appropriate site' is the preferred alternative. If disposal plans are similar to those discussed for the nonhazardous waste, the hazardous wastes will either be landfilled, (landfilled with some shale or landfilled separately on site elsewhere. There was no discussion of the type or volume of hazardous waste to be generated (see FRG, Section 3-12) (3-12) (see on shale developments wastes). Also, since shale may be toxic (see RCRA type extraction test results verifying this were included in the DEIS) and possibly ignitable, where it will be landfilled by a MTLGP before transport to the disposal site that it may still become classified as hazardous per RCRA.

Other comments are as follows:

1. Clear Creek Shale Oil Project may have to utilize (ultimately) as a generator, transporter or TSD facility, under RCRA or State authority, when its revenue is from EPA.

2. The Mesa Valley Fill site is to be located over the underground shale oil mine - potential subsidence in the future may disrupt spent shale pile integrity.
3. The Mesa Valley Fill site is to be located in the Clear Creek alluvium overlying the Mesa Formation, the upper member of the significant bedrock groundwater aquifer in the area. Subsurface may provide avenues for spent shale leachate migration into this bedrock aquifer system.
4. Waste disposal in the mine and open pit will also occur within the Mesa Formation and lower Frisco Creek member of the Grand River Formation. Together these areas make up the aquifer bedrock aquifer in the area.
5. The Clear Creek alluvium may also have a significant sand aquifer with a saturated thickness of from four to eight to twenty feet. It is unclear how much of this aquifer is to be removed at the Mesa Valley Fill site.
6. There is no discussion of spent shale runoff and leachate containment in conceptual design of the Mesa Valley Fill site - adequate protective measures for the Clear Creek alluvium have not been addressed. There was a cryptic reference to the "potential construction" of underdrains at the site.
7. The Clear Creek alluvium aquifer is a product of runoff and groundwater recharge from topographically higher bedrock. The alluvial aquifer is a source of recharge to the Mesa Formation underlying it.
8. There is an obvious omission of information in the DEIS for the off site disposal facility proposed in scenario 3.

STP/s

COLORADO DEPARTMENT OF HEALTH

Richard Lamm
Governor

Phyllis A. Taylor, M.D.
Deputy Director

March 10, 1983

Adam Poe, Program Director
Joint Review Process
Department of Natural Resources
1313 Sherman Street
Denver, CO 80203

Dear Mr. Poe:

We have reviewed the Clear Creek Shale Oil Project BEIS and find that there would be minimal impact to the water quality or aquatic life if the proposed action project configuration is followed.

The Water Quality Division would, however, like to be on record as being opposed to any deviation from the configuration which could create impacts to the main Creek drainage above the confluence of Clear Creek. This portion of the drainage supports a unique aquatic ecosystem that has three species of naturally reproducing trout.

If we can provide any further information, please contact us.

Sincerely,

R. Dennis Anderson
R. Dennis Anderson
Unit Chief
Planning & Standards Section
Water Quality Control Division

RD:ars

cc - Tom Bennett - Water Quality

sent 4/1/83

4810 EAST 11TH AVENUE DENVER, COLORADO 80220 PHONE (303) 320-5333

Mr. Adam Poe
April 15, 1983
Page 3

If at some point access from the facilities north of Fruita is provided to SR 139, this access point will also need to be channeled.

With Interstate 76 being completed in the Deloque area, we will not need any major improvements to the State Highway system. However, there will have to be considerable improvements made to the county road system (Rosa Creek, Deloque bypass, etc.) in the Deloque area.

In addition to the above requirements, we also request that funds be set aside either in an escrow account or by the developers of the Clear Creek project which will assist in the yearly maintenance of major access roads to the project facilities (Deloque, Fruita). This money would be used by local or state governments to annually maintain roadways for work like asphalt overlays or chip seals, extensive patching of roadway surfaces, adding shoulders or climbing lanes as needed, and channelizing additional intersections if needed.

The water diversion point between Fruita and Lamm and the resultant pipeline that will move water from the Colorado River to Big Salt Lake Reservoir will require crossing I-70 and SR 6-60. These crossings will have to be berms (rather than open cuts) under these roadways and will require permits prior to beginning work in the highway rights of way.

Should the proposed action as shown in the Draft EIS be changed or modified in a way that would further impact the area transportation networks (local, county, state) we will need to review specific project plans in detail to ensure that adequate mitigation measures are provided for all impacts to the transportation system.

Thank you for the opportunity to provide comments on this document, and we look forward to reviewing the Final EIS.

Very truly yours,

Harvey R. Atkinson
Director
Division of Transportation Planning

By: Thomas K. Thomas
Thomas K. Thomas
Manager
Project Development Branch

RD/az

DEPARTMENT OF HIGHWAYS

4501 East Arkansas Ave.
Denver, Colorado 80222
303-733-6001

April 15, 1983

Mr. Adam Poe
Joint Review Process
Department of Natural Resources
Room 716
1313 Sherman Street
Denver, Colorado 80203

Dear Mr. Poe:

The Colorado Department of Highways has completed its review of the Draft Environmental Impact Statement for the Clear Creek Shale Oil Project and has the following comments.

Over the past year we have provided the State Legislature and the Bureau of Land Management with comments on the Clear Creek project. Consequently, the Draft EIS identifies most of the impacts to the transportation network in the affected project areas. From information presented in the Draft EIS, it is evident that this project will have impacts on the transportation system in both the Deloque and Fruita areas, but primarily in the Deloque area.

The Draft EIS states that with the project action there will be approximately 8,000 vehicles per day moving from Deloque to Clear Creek West southwest of Deloque. There will also be worker movements between the Grand Junction and Fruita areas to some water storage facilities located north of Fruita. The Draft EIS indicates that by improving access to the site and upgrading facilities there will be low to moderate beneficial impacts to the transportation system. The upgrading of major access roads to the Clear Creek facilities will be of some benefit, but it will be limited to state and county roads. That adding a significant number of new and truck trips to the existing transportation system will result in adverse impacts to these public roadways. These impacts include increased congestion, roadway deterioration, increased potential for accidents, and a reduced level of service. We feel that additional mitigation measures are needed to help alleviate these impacts.

Due to current traffic levels on some roads (SR 6-60 west of Grand Junction - Section 10 of Draft EIS) and poor condition of the roadways (SR 139), increases in traffic resulting from this project could result in overcrowding and deterioration of the major access roadways in the project area. Therefore, some roadway improvements will need to be incorporated. Interactions with SR 139 and possibly SR 139 will need to be fully channelized and signalized when warranted. In addition, should the project result in a significant number of truck trips on SR 139, the lower five miles will have to be upgraded to increase stabilization and add shoulders. These improvements will need to be funded and completed when the Clear Creek development begins.

STATE OF COLORADO

DEPARTMENT OF AGRICULTURE

1313 Sherman Street
Denver, Colorado 80202
303-866-2811

MEMORANDUM
83-119

DATE: April 30, 1983

TO: Adam Poe, Joint Review Process

FROM: Jim Raligh, Colorado Department of Agriculture

SUBJECT: CLEAR CREEK SHALE OIL SHAFT EIS

The Colorado Department of Agriculture has the following comments

- Impacts upon the Agricultural Sector.** The draft EIS points out the number of acres of land that may be lost due to direct impacts and states that significant losses may also occur due to the resulting economic constraints. The final EIS should also look at the impacts these losses may have upon farm income in the region and also upon support industries such as equipment dealers, seed and fertilizer suppliers, and agricultural processing facilities.
- Land Values.** The final EIS should discuss how this project and the indirect impacts associated with it may affect agricultural land values in this region and how changes in land values will affect the continuation of farming in this region.
- Water Use.** The final EIS should address the amount of water which will be required for urban and commercial growth associated with the proposed project and how this will affect irrigated agriculture in the area.
- Agricultural Labor.** The draft EIS mentions the potential for competition for labor between energy and agriculture. The final EIS should discuss measures which may help to mitigate this problem such as job sharing or ranch and farm leave during important agricultural periods such as lambing, calving or harvest.

Richard L. Lamm,
Governor

1. Gene Gendron,
Deputy Commissioner

David Gendron,
Deputy Commissioner

Agricultural Commissioner

Norman Jensen,
Deputy Commissioner

Ben Sorenson,
Deputy Commissioner

John Walker,
Deputy Commissioner

Ellen White,
Deputy Commissioner

Don Weisbach,
Deputy Commissioner

William Peterson,
Deputy Commissioner

William Peterson,
Deputy Commissioner

Charles Johnson,
Deputy Commissioner

David Johnson,
Deputy Commissioner

David Johnson,
Deputy Commissioner



The Colorado Heritage Center 1500 Broadway, Denver, Colorado 80202

March 25, 1983

Adam Fox
Program Director, Joint Review Process
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, Colorado 80203

RE: Clear Creek Shale Oil Project

Dear Mr. Fox:

This office has reviewed the Draft Environmental Impact Statement for the Clear Creek Shale Oil Project.

Comments number 1, 2, and 4 outlined in our October 19, 1982 correspondence (enclosed) are still applicable to this document. We anticipate consultation with this office by the Bureau of Land Management (BLM) in order for DEN to fulfill its Section 106 compliance responsibilities as implemented in the Advisory Council regulations, 36CFR800.5.

If this office can be of further assistance, please contact the Compliance Division at 866-3792.

Sincerely,

Barbara Soller
Barbara Soller
State Historic Preservation Officer (Acting)
86/8035ee



The Colorado Heritage Center 1500 Broadway, Denver, Colorado 80202

October 19, 1982

David A. Jones
District Manager
Bureau of Land Management
Grand Junction District
784 Hoffman Drive
Grand Junction, Colorado 81501

RE: Clear Creek Project FHS

Dear Mr. Jones:

This office has reviewed the above document and has the following comments:

1. The Bureau of Land Management (BLM) has not begun the consultation process with this office to determine the eligibility of the cultural resources located within the impact area of this project pursuant to 36 CFR 800.4. This should be completed in the earliest stages of planning to insure adequate consideration of the cultural resources. We request a list of the cultural resources, the BLM's determination of eligibility and effect and a list of the cultural resource survey reports.
2. Prior to any construction that may impact cultural resources, testing for eligibility and the mitigation of the adverse effects to eligible resources must be completed.
3. On page 4-10-3 paragraph 1, sentence 1, "Colorado State Archaeologist" needs to be changed to the Colorado State Historic Preservation Officer.
4. We agree that all areas where there have been no cultural resources surveys, must be surveyed prior to any construction activities taking place to determine if there are eligible sites that may be impacted.

If this office can be of further assistance, please contact the Compliance Division at 866-3792.

Sincerely,

Arthur C. Townsend
Arthur C. Townsend
State Historic Preservation Officer

ASL/HSG:G
Enclosure



United States Department of the Interior

NATIONAL PARK SERVICE
AIR QUALITY DIVISION
P O BOX 25287
DENVER, CO 80225

IN REPLY REFER TO:

May 2, 1983

25614(475)

Memorandum

To: District Manager, BLM Grand Junction

From: Acting Chief, Policy, Planning and Implementation Branch
Air and Water Quality Division - Denver

Subject: Draft EIS for Clear Creek Shale Oil Project

We have reviewed the draft Environmental Impact Statement for Chevron's proposed Clear Creek Shale Oil Project. Based on our review, we continue to have significant reservations about the project and about the impact analysis that was performed.

The National Park Service has raised concerns about the EIS in writing on two earlier occasions, first on December 17, 1981 in a memorandum which we submitted as part of the scoping process for the project, and later on October 27, 1982 in our comments on the Preliminary Draft EIS. Neither EIS reflects the concerns previously raised, these concerns are incorporated herein by reference. Additionally, we met with your staff and the air quality contractor for the EIS on November 19, 1982 to discuss MS concerns. It appears as though many of the issues we discussed in previous memoranda and in our meeting were not adequately addressed in the EIS.

The National Park Service is concerned with the proposed project because of the air quality impacts which may occur at Colorado and Missouri National Monuments. The EIS estimates extremely high SO_2 (estimated as PM_{10}) concentration levels, and predicts that the National Ambient Air Quality Standards for SO_2 will be violated under the proposed action. It also predicts that the annual and 24-hour PM_{10} and 24-hour TSP class II increments will be exceeded and/or exceeded.

Even with the projected emissions and violations, the EIS does not adequately analyze potential impacts on the park units in its proximity to the project. For example:

SO₂ Impacts: The EIS estimates that the National Ambient Air Quality Standard for SO_2 will be violated under the proposed action. The EIS does not, however, give estimated SO_2 concentrations at Colorado National Monument.

SO₂ Impacts: Mitigation and control facility emissions should have been included in the SO_2 increment analysis for Colorado National Monument for the Prairie 1

(F1-100) alternative (Table 4-2-21) as they apparently were for the Prairie II (F11-100) alternative (Table 4-2-22).

Visibility: Agreements on visibility impacts were performed for impacts on Dinosaur National Monument. The visibility impact analyses for Colorado National Monument are confusing because it is not clear which scenarios were analyzed, and because the EIS does not present quantitative results of any analyses that were performed. Was a visibility analysis performed for Colorado National Monument (CNM) which estimated the potential cumulative impacts of the mine, transport and upgrading facilities? Was a visibility analysis for CNM performed for the F1-100 alternative? Were the results of the F11-100 Level-1 visibility analysis for CNM significant?

Air Quality Related Values: As far as we can determine, no impact analyses were performed to determine whether or not air quality related values other than visibility, e.g., sensitive plant species, would be impacted by the predicted concentrations at either Colorado or Dinosaur National Monument. We requested an AQRA analysis in both of our previous memoranda, and it seems that the SO_2 and PM_{10} concentration levels predicted in the EIS warrant a clear examination of potential impacts on air quality related values.

Impacts to FSD Applications: The EIS frequently references Chevron's FSD application as a source of more detailed emissions and modeling information. We note that the FSD applications are not complete at this time, and that we have been unable to obtain a copy of even the incomplete Clear Creek application. We question the appropriateness of using a reference that is historically unavailable to the public.

We believe there are critical issues which need to be addressed before the final EIS is prepared. We are available to meet with you and your staff the week of May 23 to discuss these concerns in greater detail.

Henry J. Spencer
Henry J. Spencer
Acting Chief

35

Model

Mr. Robert Chize
May 2, 1983
Page 2

Specifically providing that the actual selection and implementation of programs would be based upon negotiation with local officials at the time of project development results in effective identification of the most suitable methods to alleviate socioeconomic impacts.

We hope these comments will be of assistance in preparing the final EIS for the Clear Creek Shale Oil Project. If you have any questions, please contact Bruce L. Higgins, Jr. at 303-628-0271.

Very truly yours,

Robert Chize
Robert C. Chize

GLH/ass
Attachment

cc: Mr. H. Marshall - HOC - NY
J. F. Treuschle - HOC - NY

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ATTACHMENT TO MOBIL'S COMMENTS ON BLM'S DEIS FOR
THE CLEAR CREEK SHALE OIL PROJECT

ENVIRONMENTAL CONSEQUENCES

CUMULATIVE IMPACTS

General

The sections discussing surface water, soils, visual resources, and cultural resources reach conclusions that significant cumulative impacts could or will occur. However, no detail is provided beyond the relatively general legislation as to the occurrence of impacts. Impacts of the project are identified as being significant, the nature of the impact should be specifically described and quantified. The criteria of significance should be developed by presenting the projects included in the cumulative analysis and the individual impacts assumed which lead to the conclusions.

Air Quality

We strongly believe that the TAPAS modeling method used in the Cumulative Impacts section of the DEIS is unduly conservative and the pollutant concentrations reported in this section significantly overestimate the air quality impact of potential oil shale sources. Although the TAPAS modeling technique is more sophisticated and potentially more accurate, the unrealistic model parameterizations and input data used severely limit its accuracy in this application.

One source of model conservatism is the assumption that meteorological conditions remain constant for 74 hours. The assumption that wind direction and speed remain constant over 74 hours is unduly conservative. Actual wind measurements show that, even when winds are persistently in the same wind-direction sector at similar speeds for long periods of time, small variations in hourly average wind directions and speeds occur. This variation, while relatively insignificant for 1- to 3-hour periods, becomes very important for periods as long as 48 hours. In effect, BLM's modeling technique assumes that all pollutant puffs released over a period of 74 hours from the same source and up to exactly the same place. This assumption significantly overestimates the average pollutant concentration that would occur over a 74-hour period.

The model also ignores any dispersion that would occur due to horizontal and vertical wind shear. Inspection of model-generated wind fields contained in the DEIS indicates that large horizontal wind shears occur in most areas even in the absence of wind shear produced by horizontal variation in the large-scale weather pattern. Large vertical wind shears should also occur in rough terrain, particularly during the stable worst-case meteorological conditions used in the modeling study. These shears will significantly increase dispersion rates over those used in the TAPAS model, particularly at longer travel times.

Another conservative assumption is the use of flat terrain dispersion coefficients. These coefficients understate the undesirable dispersion in western Colorado. Increased turbulence and, therefore, dispersion are expected where

1

35

ATTACHMENT CONTINUED

horizontal and vertical wind shears are large and in turbulent wakes behind terrain obstacles.

The effect of all the assumptions described above is additive. Therefore, the TAPAS model predictions will severely overestimate 74-hour average pollutant concentrations in the region modeled.

WATER RESOURCES

Surface Water

The worst case flow analysis presented on page 4-61 is misleading and should be clarified. The analysis indicates maximum withdrawal of 79,000 acre-feet annually for operations plus 375,000 acre-feet for reservoir storage under water right decrees. The style of writing leads the reader to believe that the total maximum case diversion of 454,000 acre-feet will occur on an annual basis. This is further emphasized by the statement which follows that "10 percent of the mean annual flow could be diverted." Without explanation or clarification, this statement will create an undue and unfair portrayal of actual consumptive use by oil shale facilities.

The purpose of the reservoir is to provide carryover storage during low flow periods and to augment direct diversion rights. The information presented in the DEIS alludes to or refers that the reservoir will be drawn down to zero storage and completely refilled every year. In actuality, probably only a portion of that storage would be used on an annual basis and, thus, only a portion would refill each year. In addition, sound engineering design and operating practices do not allow for total drawdown of a reservoir every year since a specified volume is provided for inactive and dead storage below minimum pool level. If 79,000 acre-feet per year were available under direct diversion rights, little, if any, water would be required from reservoir storage. Thus, the volumes of water discussed (79,000 and 375,000 acre-feet) are essentially mutually exclusive and not additive as presented in the DEIS.

The 375,000 acre-feet for filling of the reservoir would be expected to occur only once in the lifetime of the facility upon initial operation. This filling would also occur over time, possibly several years, in a staged operation. Once again, sound engineering practice in conjunction with Colorado State Engineer dam safety regulations require that a reservoir of this size be filled gradually so that stability of the structure and embankment can be assessed incrementally prior to full reservoir operation. As a result, even under initial operations the diversion of 454,000 acre-feet in one year would be extremely unlikely, if not impossible.

ANIMATED ECOLOGY

General Impacts

On page 4-60, it is indicated that the Fish and Wildlife Service is fulfilling the requirements of the Fish and Wildlife Coordination Act and the Endangered Species Act by completion of a biological assessment. Since the assessment is quoted in the DEIS and its conclusions could be important, we believe the final results should be incorporated into the final EIS.

35

ATTACHMENT CONTINUED

Water Supply

The data presented in Table 4-7-2, page 4-74, is misleading and confusing without substantial clarification and clarification. The table depicts the maximum legally divertible volume of water over time, utilizing the Reclamation Service-Chenoweth (RSC) water rights. Presentation of the data in this format may lead the reader to believe that this scenario represents a proposed annual operating practice. If the diversions shown were in fact diverted throughout the year as indicated, total withdrawals would be nearly 300,000 acre-feet per year. It is difficult to conceive how the RSC practice would require such a volume of water for operations. In addition, this volume is far in excess of the proposed requirements discussed under the proposed action in the DEIS.

We suspect that some specific language and discussion be provided to indicate that the diversions shown represent a maximum legal diversion in any one month under average flow conditions of the Colorado River at Balmora. This table should be clearly labeled to indicate this is the worst case scenario in any one month. In addition, the data should be divided by the number of months in a year. In addition, if the data from the U.S. Geological Survey (1958) shown in Table 3-6-1 were used in this scenario, maximum percentage of river flows diverted would decrease to 35 percent rather than 37 percent as indicated.

TERRESTRIAL ECOLOGY

The reference to Reference (1980) on page 4-78 regarding the inaccessibility of watershed area in supporting native or desirable vegetation is misleading. Native vegetation measures will affect revegetation success, the words, "without management input such as seeding and fertilization" should be added. In addition, we note that the reference is not listed in Reference Section II.

An explanation for the statement on page 4-78 regarding low revegetation potential of riparian woodlands should be provided. We understand that as long as the hydrologic regime is not severely altered, the revegetation potential of riparian areas is quite high because of deep soils and favorable soil moisture conditions.

Tables 4-8-1 and 4-8-4 on pages 4-78 and 4-82, respectively, are not clear. The DEIS should explain how the 1000 or 5000 figures were determined. When millions of pounds of animal products (meat and hide) are divided by the number of animal units (meat), the amount of animal production per AUM range from 10 to 20. Current Range Management literature equates one AUM with 600 pounds of available dry forage. The calculations should be checked and reasonable factors for forage available and range utilization (grazing intensity) should be included in the calculations.

On page 4-80, paragraph 3, lines 6 to 8, the statement is that, "Although the big game habitat value of surface riparian lands could be partially and perhaps temporarily (due to the time required through revegetation with native plants, a long-term reduction in seasonal big game use and productivity would occur." The final EIS should explain the revegetation studies on riparian lands should be more temporary than the existence of the undisturbed native vegetation. The basis for the conclusion that a long-term reduction in seasonal

The sections on the required electricity, coal, and aggregate resources for the project need more coverage in terms of their sources, the potential size of the mine and power facilities, and their regional impacts.

Use of infrastructure energy, i.e., energy used by employees, their families and secondary industry, is inappropriate since employees of an oil shale plant would be expending this energy even in the absence of their employment. If no plant existed, the same amount of energy would be consumed elsewhere in the United States. Therefore, since there is no net increase in infrastructure energy as a result of a plant, this should not be calculated against energy efficiency.

5-117

MEMORANDUM

TO: Chevron EIS Team Leader
Bureau of Land Management
164 Harrison Drive
Grand Junction, CO 81501

FROM: Elizabeth N. Moon
Project Director *Chesapeake*

DATE: April 26, 1983

RE: DEIS for Chevron's Clear Creek Shale D11 Project

I have been asked to comment on the DEIS for Chevron's Clear Creek Shale D11 Project. I am a demographer and sociologist and have been doing research in Colorado energy-resource communities since 1975. I will limit my comments to the SIA, the socioeconomic portion of the DEIS.

Quite frankly I was surprised at how limited in scope and weak the SIA was. Considering how much money BLM recently spent on the social effects of the project and the Guide to Social Assessment (Mountain West Research, 1982), one could have expected considerable improvement over previous SIA's. In fact the Chevron SIA is a giant step backward and even more primitive than the Green methods, and documentation are all absent or inadequate. In addition, most of the literature on SIA has been ignored. In addition to making a mockery of the NEPA law through acts of omission, the SIA also violates the law through acts of omission.

To be more specific:

1) **Population Projections.** Since most of the SIA and other portions of the DEIS are derived from the population projections, this is one of the most important components of the DEIS. Since no documentation is provided, it is impossible to evaluate the population projections. However, it appears that the Colorado DEIS staff has used only for employment and overall projections. This is a surprise since this model is not complete, it has received considerable criticism, has been rejected by local communities, and has not met very well in a trial run. (I am not critical of the "Vision Forecasting" forthcoming Population Research and Policy Review). Moreover, in response to criticism, CHEV has said that this model is not to be used for forecasting, but rather to explore the implications of different "scenarios." Consequently, I must seriously question the validity of the employment and population projections and all aspects of the DEIS that are derived from them.

Campus Box 485 • Boulder, Colorado 80309 • (303) 442-4147

Friends of the earth has become increasingly concerned about water issues in the Colorado River basin as one shale project after another has moved to take up water rights. Even though we are aware that shale projects are projected to use great amounts of water, we are amazed at how lightly the DEIS disposed of the fact that the project could consume up to 10.5 of the available flow of the Colorado River. If for no other reason, the BLM should not be a party to the project, especially if operating at the Fracture Alternative at 100,000 gpd needs to be more thoroughly described and evaluated. The impacts on the drainage, especially in terms of wells and water rights, are not estimated. The long-term impacts on the salinity and compact oil losses of the Colorado River Basin also should be evaluated as to the possibility of water rights. Chevron's proposed use of ground water, and any resulting impacts from use or free spent shale disposal, and I have asked the regional BLM personnel to evaluate "Spent Shale." I also suggest that the BLM spend an hour with Lucie Fischer and ask him what taking 10% of the River's flow would do.

The BLM unfortunately shows more time discussing why certain corridor alternatives were deleted than it is evaluating the cumulative, wide-ranging impacts that opening up new industrial corridors will have on the region. We have great difficulties with the Fracture I proposal because it does open up an entire new corridor in a relatively undeveloped region on one hand and impacts a productive agricultural area on the other hand. The Clear Creek proposal are definitely undesirable from the standpoint of such line impacts. I also found it interesting that the BLM does not clearly state that the reason for the EIS is because Chevron made and wants a wide variety of actions decided in order to judge its bets for the future, since they obviously don't know which corridor they will actually open up. Because so many corridors and associated facilities are discussed it is difficult to evaluate the actual impacts of the project. Also, Mr. Kline, as you told us, the regulations may not require any land, water, and/or public participation when Chevron actually initiates its applications for rights-of-way. So this EIS may be the only opportunity for the public to evaluate the alternatives right-of-way. Therefore, it behooves you to do a straightforward analysis of the individual, as well as the cumulative effects of granting the right-of-way. And please compare the alternatives in a good narrative fashion. One thing to include in the analysis is how the corridors will open up the black country, which does not mean only more industry, as other than the BLM, but more black areas destroying habitat, poisons, aquifers, etc.

In sum, while the DEIS was an ambitious undertaking in terms of scope and detail it falls short in evaluation of impacts, and barely touches on mitigation measures. The rationale on alternatives is flimsy, and many other studies, such as back-up or reference (to footnote). The overall time was obviously more to display the negative impacts. For example, the DEIS does not even mention shale landfills as a potential environmental concern which may have a long-term impact on northern Colorado. The spent shale is an epidemic which is projected to be dumped in the desert drainage. Water quality impacts have been, and will continue to be a major problem regarding shale disposal. Let me tell you that the entire EIS should be rewritten, and possibly re-structured, so it reads less like an encyclopedia or a legal document, and more like an impact analysis which it is meant to be. The cumulative impacts of the proposed Clear Creek Project with other shale shale projects in the region also needs to be discussed, otherwise how can the BLM truly evaluate the social, economic, and environmental impacts of the proposal.

Thanks for the opportunity to comment. Please call if you have any questions.

Connie Albright - Colorado Representative

Chevron EIS Team Leader
Page Two
April 28, 1983

2) **Cumulative Impacts.** Contrary to the law, cumulative impacts (i.e., the joint consequences of this and neighboring projects) are not taken into account. The only alternative is the no action which does not include other likely shale oil development. This is most evident in the assumption (p. 4-107) that all operations workers will be local residents and that EIS of the construction phase workforce would be local. If other shale oil operations are resumed, or even if other energy resource development is expanded, these assumptions cannot possibly hold. The DEIS underestimates the cumulative population growth and related impacts. Further, the often verified finding that with rural industrialization there is a greater rate of population growth that require experience and skills seems to have been ignored. The higher the level of unemployment elsewhere in the state and nation, the more likely newcomers are to get the unemployment and the higher the rate of population growth and related impacts is needed to evaluate cumulative effects of likely projects in the region. That is, after all.

3) **Social Impacts.** A social impact assessment has not been done. Instead, there is a handful of social problems of current concern in the area are listed. There is no discussion of any more problems or how energy-related growth and change may influence these and other social problems. There is considerable evidence that social problems of all kinds increase with energy boom and bust and that these problems are more serious than the rate of population growth among all strata of the population. In fact these problems can be linked to the rate of growth, boom and change in the population. Whether the population is growing or declining, the EIS predicts a rather substantial boom/bust with the transition from construction to operation phases but totally ignores the implications. Rapid change, unemployment, and frequent migration all create stresses that lead to social problems. The recent shale oil bust in Colorado has already contributed to increased rates of crime, mental illness, and domestic violence and put considerable burden on social services. I wonder if anyone prepared this part of the SIA has ever read in newspapers or the professional literature about what is happening in western Colorado, much less visited there or talked with residents and human services workers.

Following the scanty assessment of social impacts the rest of the SIA is devoted to housing, education, facilities, services and fiscal impacts. This discussion is primarily in terms of capital expenditures, and not the quality of or changes in curriculum and services that might be desirable. Since these projections were done without considering other likely energy development and assume any excess capacity will be available to Chevron-related growth, they are rather meaningless because nearly every other EIS assumes the same thing.

However, even if it could be assumed that Chevron will be the only other project to affect baseline projections (i.e., no action), the findings are of little use because they are limited to quantitative and physical aspects and because so little information is given in Appendix B-4 that the FISPLAN model cannot be evaluated.

Chevron EIS Team Leader
Page Three
April 23, 1983

There is something wrong when the present and future residents of a community are treated as if the most important aspects of their community, family and individual lives are public expenditures, buildings, and infrastructure.

4) **Mitigation.** More NEPA is violated. The "Detailed Social and Economic Mitigation Measures" in Appendix C-2 are nothing more than some economically vague suggestions regarding housing, public facilities, infrastructure, services, and land use. Although many of these suggestions may be quite helpful if properly developed, the implicit philosophy suggests that the prevention of social problems is not of great concern. It seems to me that if the federal government and the operators of the Chevron project are even slightly concerned with justice and the well-being of the citizens, then prevention of social problems would be an explicit priority.

5) **Editing.** There is a significant editorial oversight regarding the SIA. The BLM sociologist has a lot, not an M.S. in sociology and no other graduate degrees. I do want to thank the editor for avoiding further specific language and for the renaming of non-camps to the more appropriate and accurate title "single-status" camp.

6) **Summary.** In sum, I can only call this SIA a sham. It is a hypocrisy of unsubstantiated assertions which do not appear to have been derived from theory, previous research, the experiences of energy resource communities or energy workers, or even BLM research and guidelines on SIA. Camp Dresser and McKee and BLM have wasted public money and made light of the well-being of U.S. citizens.

DHM/gsh



NATIONAL WILDLIFE FEDERATION

ROBERT J. GOLDEN
CHAPMAN

3 May 1983

Mr. Robert Kline
Chavon E. Team Leader
Bureau of Land Management
766 Morrison Drive
Grand Junction, CO 81501

NATIONAL RESOURCE CLINIC
FLORIAN L. BUILDING
BOULDER, COLORADO 80502
RECEIVED

FRANCIS M. GREEN
CHAVON

Re: Clear Creek Shale Oil Project
Draft Environmental Impact Statement

Dear Mr. Kline:

The following comments on the Clear Creek Shale Oil Project Draft Environmental Impact Statement ("DEIS") are submitted on behalf of the National Wildlife Federation ("NWF") and the Colorado Wildlife Federation ("CWF"). In addition to these comments, we also adopt and incorporate by reference the comments on the DEIS submitted by the Environmental Defense Fund and Friends of the Earth.

NWF is the nation's largest private conservation organization with over 4.8 million members and supporters, 20,000 of whom live in Colorado. CWF, a state affiliate of NWF, has more than 12,000 members. Both organizations have serious concerns about the adverse environmental impacts that will result from proposed oil shale development in the Piceance Basin, including the Clear Creek project. Unfortunately, the DEIS does not provide sufficient information for the reader, or a decision-maker, to know what these impacts are likely to be and, thus, to judge whether the proposed action (in this case issuance of a right-of-way) should be approved.

The principal defect of the DEIS, in this regard, is its failure to present any real cumulative impacts analysis—that is, to describe what the region will look like in 10, 20, etc., years with and without the Clear Creek project. The DEIS is also defective in that it fails, in some instances, to specifically and adequately identify even the anticipated impacts of just the Clear Creek project. This is particularly true with respect to impacts on wildlife, as will be discussed below.

In sum, the cumulative impacts analysis is completely inadequate and reminiscent of that contained in the 1980 Grand River/Basin Fork coal DEIS. We hope that NWF will be willing to try to correct the deficiencies in this DEIS, as it was in the coal DEIS.

Wildlife Impacts

The DEIS's discussion of wildlife impacts resulting from development of the Clear Creek project only, while more extensive than the discussion of cumulative impacts on wildlife, is almost as deficient. Not especially, pp. 4-80-84 (proposed alternative impacts) and pp. 4-85-86 (preferred alternative impacts). While it does quantify, in acres, the projected loss of critical winter range and habitat for some species in an attempt to quantify the effect of this loss on the various populations, it notes only that "the general effects could be significant" (p. 4-86). There is no indication, for example, of whether 10 deer or 1000 deer will be affected, or by what percentage the total population might be reduced.

Another example of the inadequacy of the analysis is the treatment of porophom. In discussing the effected environment, the DEIS notes that porophom have been reintroduced to the Grand Valley, that the size of the herd has remained at about 50 during recent years, and that the porophom was year-round the DEIS proposed for the Grand Valley plans also (p. 3-46). The analysis of the impacts of constructing the Grand Valley plant, however, says only that it would effect habitat use patterns of the porophom herd and reduce porophom habitat by 1,352 acres. It leaves the reader to guess what effect this might have on the herd itself.

In sum, the analysis of impacts on wildlife is so lacking in detail that it provides the reader with no real understanding of the extent of the impacts. In several places, the DEIS states that "additional detail" or "detailed descriptions of potential impacts" will be provided by the U.S. Fish and Wildlife Service ("FWS") Coordination Act Report and the NWF Biological Assessment and related NWF-Biological Opinion: required by section 7 of the Endangered Species Act, 16 U.S.C. § 1532, 88 Stat. These documents are currently being prepared. This tiered approach, however, is unacceptable. Sufficiently adequate analysis of potential impacts of a proposed action must be contained in a DEIS to allow the public a meaningful opportunity to comment. The reports now being prepared must be made available for public comment, and a supplementary DEIS issued, if NWF intends to rely upon these reports to produce an adequate impact analysis.

Other Impacts

Following are a number of additional, specific comments on other aspects of the DEIS:

Finally, and perhaps most troublesome, is the Bureau of Land Management's ("BLM's") failure to—indeed affirmative disavowal of any responsibility of authority to—propose mitigation requirements on the operator that could alleviate, if not completely remedy, some impacts. On p. 4-173, BLM states that, absent specific statutory authority, it can require only safety and mitigation measures only on BLM-administered land. The consequences of such a narrow interpretation of BLM authority are perhaps best illustrated by the discussion of socioeconomic impact mitigation on pp. 4-176-177 which acknowledges that some impacts could be reduced by mitigation (i.e., "fiscal shortfalls prior to onset of project-related revenues, and potential increases in demand for human and social services"), but declines to require any mitigation. The result is that the Operator is left with complete discretion as to what steps, if any, it will take to mitigate substantial economic losses caused by its project. Such a negligent reading of BLM of its authority and responsibility is inconsistent with the provisions of the National Environmental Policy Act ("NEPA") and the Federal Land Policy and Management Act ("FLPMA"). Moreover, it is particularly disingenuous in view of the fact that BLM, by selecting a preferred alternative different from the Operator's proposed alternative, is quite clearly significantly controlling the way in which private lands and resources are used.

Cumulative Impacts

The section on cumulative impacts (pp. 4-141-170), which consists of only 10 pages out of more than 400 total for the DEIS, hardly deserves the title. With the exception of air quality and water quantity impacts, there is no attempt made to quantify the combined impacts of existing and planned projects in the region with the Clear Creek project. Following are some typical examples of the level of analysis. The section states that "[t]he cumulative impacts on water quantity and quality due to water withdrawals by this and other projects from the Colorado River would affect present and future water users" (p. 4-146), but it does not explain how water users would be affected. It notes that "[c]umulative impacts to paleontological resources are not predicted at this time" (p. 4-147). However, is it not the purpose of the DEIS to make these predictions? Similarly, the section states that "[a]gricultural productivity would be effected due to off-site developments. . . ." (p. 4-147), but does not say how or to what extent productivity would be effected. And, with respect to wildlife, the section notes only that "[c]umulative effects of development in this area may reduce regional carrying capacity for most wildlife. . . . Significant impacts of wildlife-related recreation may not be met" (p. 4-146).

Considering that the Piceance Basin contains the largest migratory water duck population in North America, as well as several other significant wildlife populations (see pp. 3-44-58), all of which could be seriously impacted by oil shale development in the region, this level of analysis makes a travesty of the requirements of NEPA.

Page 4-3—How reliable are the air quality modeling techniques used in the DEIS if they are still being developed?

Page 4-8—How will the projected impacts on viability affect users of wilderness and other recreation areas in the region? How will this effect the tourist industry, which is a major income producer for the state?

Page 4-8—The DEIS states that the estimated depletion rates are not expected to lower the levels of oyster, Upper Island, and Red Wilson. Effect below a level of 6.0 ps, but that "[i]t is not currently known what effect, if any, these shifts would have on biota." A lowering to a level of 6.0 ps is significant. The DEIS must make some effort to determine what the effect of this might be on salmon and steel head.

Page 4-14—What is the significance of the projected increase in salinity in the Colorado River resulting from project construction?

Page 4-41—The DEIS states that spent shale leachates are a potential environmental concern which may have adverse effects on surface water quality but that their impacts are "difficult to estimate." This analysis is clearly inadequate and does not provide proper recognition of the seriousness of potential pollution from toxic leachates or of studies that have analyzed this potential.

Page 4-59-77—The discussion of aquatic ecology is deficient in that it completely ignores the potential for adverse effects above in our comments on wildlife impacts. That is, no attempt is made to quantify the impacts on aquatic biota. The section itself notes that it is a "first approximation of the likely impacts" which the various reports referred to earlier will supplement. As noted earlier, this procedure does not constitute the level of public comment required by NEPA. The sentence noting the potential impacts on the endangered squawfish (p. 4-76) is clearly inadequate.

Thank you for the opportunity to comment.

Yours truly,

Robert E. Lugin
Robert E. Lugin
Legal Intern
dn

Francis M. Green
Francis M. Green
Counsel



ENVIRONMENTAL DEFENSE FUND

May 3, 1983

Robert Kline
EIS Team Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, CO 81501

Re: Clear Creek Shale Oil Project EIS

Dear Mr. Kline:

Enclosed are comments on the Draft EIS for the Clear Creek Oil Shale Project on behalf of the Environmental Defense Fund and its members. Pursuant to your conversation with Richard Hughes of our office it is our understanding that you will accept these comments as timely if they are postmarked by May 3, 1983.

In some respects, the ability to file comprehensive comments was rendered impossible by the lack of adequate description of the project, the failure to explain methods of analysis or the absence of data used to reach conclusions presented in the DEIS. Where appropriate, our inability to prepare comments as a result of these types of deficiencies is identified in the comments. We appreciate your efforts to overcome some of these deficiencies by meeting with me on April 29 at the offices of your contractor, Comp/Tresser and McKee. However, not all of the information requested at that meeting was ultimately provided. We expect that you will overcome these deficiencies prior to publication of a Final EIS for this project.

We have generally not repeated here the detailed comments we made at the public hearing. We assume the issues raised at the hearing will be addressed without further comment. However, as a follow-up to our statement at the public hearing, we think it is appropriate to bring to your attention an important legal principle established by the NEPA case law. The lead agency responsible for an EIS has a clear duty to perform a searching and independent evaluation of data or investigations prepared by the project sponsor. NEPA's public hearing comments on the need to evaluate technology options for the control of major air pollutants from the project, such

R. Kline
May 3, 1983
Page 2

an analytical technologies for reducing SO₂ emissions, offer an example. Chevron's representative at the hearing, Al Versteeg, told me later that this and other technologies had been evaluated in the DEIS analysis submitted to EPA as part of the NEPA permit application. Under the NEPA case law, it is not enough for the EIS to simply adopt this analysis by reference. The applicant's conclusions must be independently evaluated by the agency, and the basis for the agency's conclusions must be explained. For the lack of such an independent analysis, the EIS for the Westway Project in New York City was recently found to be inadequate by the Federal courts. This principle applies to each of the conclusions contained in the DEIS permit application which are relevant to EIS's obligations for the preparation of an EIS.

Another general observation which applies to almost every report identified in the DEIS is the failure to consider mitigation measures. This becomes a particularly glaring deficiency with regard to significant impacts identified in the DEIS such as the potential failure of the spent shale pile, the dewatering of Run Creek or the large reductions in stream flow in the Colorado during mean and low-flow conditions.

Collectively, the lack of discussion of important impacts, the failure to identify analytical methods, the lack of data used for analysis and the failure to present mitigation strategies makes this one of the most seriously deficient draft impact statements I have ever reviewed.

If you have any questions regarding these comments, please contact us at your convenience.

Sincerely,
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Regional Counsel

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Comments of EDF on Draft EIS for the Clear Creek Shale Oil Project

1. Introduction.

The following comments are filed on the Draft Environmental Impact Statement for the Clear Creek Shale Oil Project on behalf of the Environmental Defense Fund (EDF) and its members. EDF is a charitable, non-profit, public membership organization, composed of scientists, lawyers, economists, educators and other concerned citizens dedicated to the protection and enhancement of human health and the environment through research and education and through judicial, legislative and administrative action. Organized under the laws of the State of New York, EDF maintains regional offices in Boulder, Colorado; Washington, D.C.; and Berkeley, California. EDF has 47,000 active members nationwide, of whom more than 1,000 reside in Colorado.

CEQ Regulations specify the criterion by which the sufficiency of an EIS is to be judged. 40 C.F.R. Part 1500 et seq. It must provide information "necessary to understand the effects of the alternatives." 40 C.F.R. 1502.15. This requirement is not met because of the many instances of the failure to provide sufficient information to understand the applicant's data bases, methods of analysis and conclusions. These failures are discussed in Section 2 below.

Regulations also require that the "information be of high quality. Accurate scientific analysis is essential." 40 C.F.R. 1500.1. "Agencies shall insure the...scientific integrity of the discussion and analysis." 40 C.F.R. 1502.24. The Clear Creek EIS violates this requirement by employing methods which are unscientific. These failures are discussed in Section 3, below.

2.0 The EIS Provides Insufficient Information.

The Clear Creek DEIS fails to provide sufficient information to comply with Federal regulations with respect to the analyses of impacts of the proposed action on visibility, ozone and particulate concentrations, and the emissions and effects of hazardous and toxic pollutants on human health, air, water, wildlife and aquatic resources. There is no consideration of the impact of the project on worker health and safety.

2.1 Visibility Analysis

The level 3 visibility analysis, described in Appendix 7 of the Joint Venture Mine and Retort P.S.D. application, (hereinafter referred to as "Retort PSD"), which has been incorporated as part of the EIS, is based on four "worst case" days. The choice of worst case scenario is critical to the assessment of significance because the applicants believe that the workbook (EPA-450/4-80-0311) "suggests" that there is no

39

significant impact unless a predicted impact occurs four times over the course of a year. Retort PSD A-7-3. In fact, the workbook specifies that the dispersion condition for deceleration calculations is to be chosen so that no more than 14 or "about four days per year" of the conditions in a year are worse than the "worst case" day modeled. Given the significance criterion adopted by the applicants the selection of worst case scenarios is important.

This data base used for worst case selection was on-site tower data. Retort PSD A-7-9. The workbook states that over complex terrain, the assumption that site data represents transport data is "not appropriate". Workbook 71. This is particularly true of regional base analysis where, the workbook points out, inversions and trapping by upslope/downslope flows may occur. Workbook 71. Grand Junction is noted for the occurrence of long-lived inversion. EIS Reference: Holsworth 1972. The workbook suggests that, where complex terrain is involved, a more detailed "level 3" analysis should be done.

At the very least, in order to provide the reader with information necessary to understand the effects of the alternatives, a true worst case visibility analysis, appropriate for complex terrain, should be done. This should include such features as:

1. A reduction of wind speeds to increase travel time, in order to simulate the more convoluted

trajectories probable over complex terrain.

2. A shift of initial/arrival times to simulate travel during the time of day with most intense radiation.

3. An increase in stability, to account for the possibility of the frequent Grand Junction inversions coinciding with worst case trajectories.

4. Simulation of multi-day stagnation episodes which occur in the Grand Junction area.

The PLOUVE Results, which indicated significant impacts are said to be "conservative." EIS 4-15, Retort PSD A-7-14. This characterization is misleading to the reader, both because the arguments supporting it are erroneous, and because the applicant fails to mention the countervailing characteristics of the model which would result in the underestimation of impacts. This violates the requirements for a "full and fair discussion." 40 C.F.R. 1502.1.

It is asserted that the observer's view covers only a small sector of "possible PLOUVE trajectories" and that a deviation of a few degrees will make the impact less severe. Letters from Al Verstruyt, dated April 24, 1983. This argument is erroneous for the following reasons:

1. Since flow over complex terrain is highly non-linear, it is impossible to predict what effect a "small" deviation will have on the observer. Though

39

the assertion is true for the unrealistic straight-line transport assumption of PLOUVE, it does not follow that PLOUVE is "conservative" - i.e. overpredictive compared to reality.

2. Though a "deviation" might divert a worst case day from the observer area, the same deviation might divert a non-worst case day into the area. Climatologically, the "deviations" have no effect.

3. PLOUVE is of uncertain accuracy over complex terrain. That is one reason to choose a worst case method of analysis. It is specious to choose a worst case analysis made and then dismiss it as "conservative."

There is no mention of characteristics of the modeling that tends to make the model underpredictive. For example, PLOUVE can not simulate conditions that lead to accumulation, such as terrain-induced stagnation, long-lived inversions and merging of sources, or the cumulative effects of multiple plumes which do not intersect, but simultaneously occupy the field of view at varying distances from the viewer.

In view of the lack of support of the asserted "conservation" of the model, such reference must be excised, in order to provide a full and fair discussion.

Several points concerning the visibility analysis are left unclear.

1. When sources were consolidated to a single

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point, Retort PSD A-7-4, what was the effect on dispersion characteristics. This procedure should be analyzed to indicate to the reader if the result is likely to be under-prediction or over-prediction.

2. Were significant visibility impacts predicted at Colorado National Monument for the Fruita 12 alternative. The EIS states only that the impacts are "the most adverse of any 50,000-MPD scenario." EIS 4-10. The reader is unsure if the impact exceeds workbook significance criteria.

2.2 Ozone Analysis.

Background hydrocarbon values reported in Table A 8-2 are "average" values. Retort PSD A-8-5. The use of these values is not worst case, if the highest observation of hydrocarbon concentrations are sufficient to increase the HC/NO_x ratio to a level that would produce increased O₃. The reader can not make this judgment unless Table A 8-2 in the Retort PSD also includes range data, as well as averages, and the model is run using highest background HC concentrations.

It is unclear how long the EKMA simulations were. Table A 8-4 reports data for only 9 hours. Summertime inversions would suggest a 16 hour simulation should be the minimum duration of each run. Longer simulations would be needed to evaluate the impacts during multi-day inversions which are common in the region. Holsworth, 1972.

39

No ozone impacts are discussed in connection with the Clear Creek or Fruita II alternatives. This violates the "full and fair discussion" requirement.

2.3 TSP Analysis.

There was no discussion of impacts on TSP non-attainment areas. It is not clear from the EIS if receptor grid points were included in these regions and if so, what concentrations were predicted. Table 4.2-18 reports predicted values for grid points 177 and 178 but does not explain where these points are located. At the meeting on April 20, we were shown the receptor grid used for the Complex I modeling which identifies these grid points. The receptor map should be included in the EIS.

There is similarly no discussion, for the Fruita II alternative, of Class I impacts, or, for the Clear Creek alternatives, of cumulative TSP impacts. This violates the "full and fair discussion" requirement.

2.4 Hazardous Pollutants.

There is no indication of what the "available data" are (EIS Section 4.2.6, p.4-20), or how any analyses were done. EIS 4-20. A letter from Chevron to Robert Yuhnke (Al Verstyuyft dated April 20, 1983) fails to describe how "nominal upper limits" were derived from pilot plant lead, beryllium, mercury, and arsenic data, nor what these data are.

Available data suggest there are three areas of principle concern with respect to atmospheric releases

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the HC resource and opportunities for oxidation later in the gas stream.

Worst case analyses for metals should be based on vaporization temperatures for each species, the known concentrations of the metals in the ore, capture efficiency of TSP control devices given assumed stack temperatures and known vaporization temperatures, and other factors which would limit the release of metals into the atmosphere from the process. A total mass-balance should be calculated for each metal, i.e., given the range of known concentrations in the shale, fractions should be estimated for each of three pathways: 1) retained in spent shale, 2) captured in flue dust, and 3) released directly to the atmosphere. Impacts should be assessed for each metal and for each pathway.

Metals retained in the spent shale should be assumed to be dispersed across the surrounding landscape in the same ratio as total fugitive dust from spent shale handling and disposal. The EIS reports that fugitive dust have been modeled using ISC with appropriate dispersion and deposition terms. Since deposition has already been calculated in the model, it is a simple matter to apply the fraction of metals retained in the spent shale to calculate the amount of each metal that will be deposited via fugitive dust on the surrounding terrain annually, and for the 90 year life of the operation. Total deposition can be calcu-

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of toxic pollutants:

1. The direct emission of toxic (includes carcinogens, oncogens and teratogens) hydrocarbons from process sources;
2. The direct emission of toxic metals known to be in the shale;
3. Fugitive emissions of these pollutants in raw or spent shale.

None of these pollutants or modes of dispersal in the environment are addressed. At best, the DEIS is inadequate on this issue. At worst it is intentionally misleading.

At a minimum, "available data" regarding emissions from the source should be described and summarized as to each toxic pollutant found in similar processes or in the shale. Where data from pilot plant tests are provided by Chevron, these should be carefully reviewed to determine the validity of sampling and lab techniques, and evaluated to assess their representativeness for full-scale operations.

If Chevron does not provide test data that are considered to be both valid and representative of full-scale operating conditions, then worst case analyses must be performed. For hydrocarbon emissions, the worst case should be premised on available data from other synfuels processes, with estimates based on comparisons of process temperatures, residence time for

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lated by adding stack emission deposition in the region. Once the deposition total is calculated for each metal of concern, an assessment can be made of the effect each metal will have on flora and fauna in the deposition area. Effects on human health via inhalation, uptake by livestock and other pathways should be considered in addition to the direct effects on livestock productivity, wildlife, and aquatic life.

COM informed NEF at the April 20 meeting that the health impact of predicted benzene emissions had been assessed. This assessment is not reported in the DEIS, nor was it made available in response to NEF's request. See Verstyuyft letter to Yuhnke, April 20, 1983. The failure to supply any written description of the analysis suggests it was not done. The analysis should be performed to determine both worker exposures on-site, and public exposure off-site. Expected groundlevel or workplace concentrations should be reported both at the source and at various distances from the site where public exposure is likely. EPA's risk assessment technique as applied by EPA to estimate risks associated with the proposed NESHAP standard for benzene should be applied here to estimate the risk to exposed populations at the selected exposure points.

Similar risk assessment techniques should be applied to other toxic pollutants likely to be emitted from the project.

10

2.5 Spent Shale Disposal.

The DSHS identifies potential damage to water resources as a result of surface runoff or leachate discharges from spent shale piles, or the possible failure of these piles. The available data regarding such potentially significant, long-term impacts are not described or summarized, nor are the methodologies used to estimate the probability of such impacts reported. At a minimum, factors contributing to the likelihood of significant leachate production, surface runoff or pile failure should be identified and mitigation measures addressed to provide means of ensuring that such risks are minimized.

3.0 The EIS Employs Improper Methods.

The EIS employs improper methods with respect to the analysis of visibility, ozone, TSP and acid deposition.

3.1 Visibility Analysis.

In a letter from Al Versteeg dated April 30, 1983, results from a level 1 analysis indicating significant plume blight for the cumulative effects of Colony, Union and CCSOP were reported. No PLUVUE cumulative run results are reported and it is unclear if these were done. This should be made clear, since mere linear addition of non-linear processes would not be a sufficient analysis of visibility impacts.

It is concluded in the April 26 letter to Yuhke that "no proper alignments" were found which would

result in a coincidence of Colony and Union plumes. Though the methodology used in this analysis is unclear, the letter implies that only straight-line transport from the source was considered. Though PLUVUE is constrained to straight-line transport, the atmosphere certainly is not deterministic of the probability of plume crossing, merger, or parallel transport will require explicit modeling. Therefore results from an assumed crossing or merger of plumes should be reported, unless explicit modeling show that such coincidence of plumes will not occur, even under worst case assumptions.

3.2 Ozone Analysis.

Background O_3 and HC concentrations assumed in the ESHA modeling are inconsistent with worst case modeling. To simulate worst case conditions, background concentration representative of the highest concentrations reasonably expected should be used. Ozone concentrations have been measured by several projects since 1974. These measurements indicate concentration well in excess of values used in the ESHA model. Compare Table 1, with Table A 8-3 of the Report PMB. In order to estimate the highest reasonably expected concentration, the entire ozone data set from all available regional sources should be analyzed. A frequency distribution of these data would enable one to determine how frequently a given concentration of O_3

Table 1
Maximum Measured O_3 Value at Various Sites
in the Oil Shale Region (ppm)

	1974	1975	1976	1977	1978	1979	1980	1981
Ch Oil Shale Site	151-156	141-6	161-4	161-4	161-4	241-6	151-6	195-0
Ca Oil Shale Site	(179) 2-5	(179) 2-5	176-2	160-2	206-3	243-3	243-3	243-3
Avail Plains Oil Shale Site								
Cherokee Creek Creek Site								
White River Oil Shale Project	(180) 5	(180) 5	(180) 5	(180) 5	(180) 5	(180) 5	(180) 5	(180) 5
Nuck Power Plant								
Union Oil Shale Project								
Parasho (27) Site A-6								

Source: 1. Oil Annual Report, No. 10, 1981 (reproduced in Exhibit 2)

2. Rio Arriba Monitoring Report 47 mo. 1980
3. Cheyenne River 1981 Interim Data Report, 1981
4. Cheyenne River 1982 Interim Data Report, 1982
5. A preliminary assessment of the environmental impacts from
6. Cheyenne River 1983 Interim Data Report, 1983
7. Cheyenne River 1984 Interim Data Report, 1984
8. Cheyenne River 1985 Interim Data Report, 1985
9. Cheyenne River 1986 Interim Data Report, 1986
10. Cheyenne River 1987 Interim Data Report, 1987
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39

miles downwind which will be in close proximity to the Clear Creek project. The transport of precursor pollutants as well as O_3 from these sources and other oil shale projects in the region should be included in the modeling for the Clear Creek project. Since O_3 considered a regional pollutant and not related to a single source plume, it is not appropriate to model the impact of the Clear Creek project in isolation.

3.3 TSP Analysis.

Two different models were used to predict impacts from mining and retorting sources. EIS 4-4. No model was run which predicts the cumulative impact from both sources. The reader is unable to understand the effect of the alteration without this information.

TSP modeling was based on meteorological data obtained at Walker Field which lies at the bottom of the Grand Valley near Grand Junction. Meeting with representatives of Chevron and BLM on April 20, 1983. There is no indication that those data are representative of TSP regional transport, particularly since Walker Field lies in the Colorado River Valley and is therefore subject to very different flow regimes compared to those occurring in the Clear Creek and Fruita sites. Since Chevron collected net data at the resort site and has access to net data from the Mack site, a correlation study should be performed to determine the representativeness of the Walker Field

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points on specified air quality related resources. Section 155(a)(3)(B). Included in this required analysis is the impact on "visibility at the site of the proposed major emitting facility and in the areas potentially affected by the emissions from such facility for each pollutant regulated under this Act which will be emitted from such facility..." Such an analysis has not been performed with the exception of Level 1 visibility analyses for BNM and CNM. This is not enough.

According to the analysis of visibility impacts on CNM, visibility will be substantially impaired in the Grand Valley near the site, and also at considerable distances downwind. These impacts should be assessed for selected points of likely public awareness, such as Grand Junction, along the Interstate at various points such as DeBeque Canyon, Rifle, Glenwood and well-known views such as Mt. Saprie from Glenwood and views from heavily used ski resorts.

Methods similar to those used by the NPS to estimate visibility impacts at Theodore Roosevelt National Park readily lend themselves to an assessment of cumulative impacts likely to result from the proposed source and other major sources in the region. The NPS technical report is enclosed.

Such a visibility analysis should also include an effort to assess the impact of predicted visibility impairment on socio-economic resources such as tourism

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data during 1981. If the correlations are not high (.5), then the modeling should be performed using 1981 site data as well.

3.4 Acid Deposition Analysis.

Lake impact analysis of acid deposition is based on an average deposition for identified Class I areas only. The analysis should not be limited to these areas. A worst case analysis should also be performed to identify the areas of greatest potential impact, and determine whether impacts would be significant. Worst case analysis requires a different approach, because species transformation occurs during transport, optional dispersion and conversion would result in an annular-shaped area of expected highest deposition. Complete washout could be assumed in this area and the region could be inspected for occurrence of sensitive geological areas. Intensive analysis should then be concentrated on those region to identify available water quality data and calculate likely effects on lake chemistry. If water quality data (particularly alkalinity) are not available, then comparisons of local geology with other areas where water quality is known would provide a basis for estimating local sensitivity of lakes in the high impact area.

4.0 The DBIS Fails To Identify Or Assess Significant Impacts.

4.1 Visibility Outside of Class I Areas.

The Clean Air Act requires an assessment of im-

15

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into the region. The causes of predicted visibility impairment should be attributed to specific pollutants as required by the Act, and mitigation measures such as siting alternatives and control technology options should be considered with respect to their impact on visibility.

4.2 Impacts On Vegetation.

The Clean Air Act also requires an analysis of the impact each pollutant emitted by the source will have on "soils and vegetation." This analysis has not been performed in either the DBIS or the PSD application. Such analysis should include, at a minimum, an identification of any valuable crops grown "in the area potentially affected by the emissions from such facility" and pollution-sensitive native species. With respect to each identified crop or sensitive species, a literature search should be performed to determine whether the crop or species is likely to be affected at the predicted concentrations in the area. If crops may be affected, a worst case analysis should be performed to assess potential losses in productivity and loss of income to growers.

4.3 Salinity Impacts on the Colorado River.

In Section 4.14.4, the DBIS states that projected development of water resources for the proposed project and other planned projects "would amount to ten percent of the mean annual flow" of the Colorado at DeBeque.

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The DEIS states that these water withdrawals "would affect present and future water users." However, there is no attempt made to assess which water uses would be adversely affected, or to what degree.

At a minimum, the resulting increase in salinity at downstream measurement points specified in applicable water quality standards should be stated. The Bureau of Reclamation has developed a standard model of the Colorado Basin for making such assessments. This model should be run using the factual assumptions of the EIS. A specific determination should be made regarding compliance with the standards and the costs of increased salt loadings on downstream users.

4.4 Worker Health and Safety.

Recent research conducted among oil shale miners in Scotland demonstrates a clear pattern of "black lung" diseases. Sutton, *Pneumoconiosis of Shale Miners*, THORAX, Vol. 36, p.412-18(1981). These data suggest that miners working in underground oil shale mines will be subject to a significant risk of premature death or permanent disability as a result of exposure to raw shale. This risk is not addressed in the EIS, but should be as part of any comprehensive analysis of environmental and socio-economic impacts of shale development.

5.0 Mitigation Measures.

5.1 Air Quality Impacts.

18

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be subject to permit limits. These should be limited by enforceable conditions imposed by BLM.

In addition, since most impacts will be on federal lands, BLM also has a duty to ensure that federal resources are protected from adverse impacts. BLM can meet this responsibility only by ensuring that impacts do not exceed those outlined in the EIS. To ensure that statutory limitations on air quality are met, BLM should require the applicant to monitor air quality in areas where greatest impacts are predicted by the EIS. The uncertainties of modeling increase the importance of knowing what the real-world impacts of the project will be after it commences operation. This burden is a reasonable one considering the size of the project, the large capital costs compared to the costs of monitoring, and the potential risk to public resources.

If BLM does not have the manpower resources needed to check the monitoring system and data after it is in place, there are many options for cooperation with the state, local governments, the USFS, NPS and EPA. These options should be explored with representatives of the respective agencies as part of identifying feasible monitoring alternatives.

6.0 Conclusion.

The Clear Creek Shale Oil Project is inadequate because (1) it fails to provide a full and fair discussion of impacts, (2) it fails to provide information necessary to an informed understanding of

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Significant cumulative impacts on air quality have been identified with respect to predicted exceedences of the SO₂ Class I increments at Flat Top and Mt. Finkle Wilderness Areas, the Class II increments at Rosan Cliffs and Grand Hogback and the NAAQS for NO₂. Table 4-14-2. Measures designed to reduce these impacts below statutory limitations have not been considered. Specifically, technology options available to reduce emissions beyond those listed in the emissions inventory should be identified, and their potential application to this project considered. Also limitations on production rates to levels that would protect statutory limitations on air quality should be considered.

5.2 Air Quality and Source Monitoring.

The impacts predicted by this DEIS on air quality, air quality related resources and human health are based on two fundamental assumptions: 1) the emission rates reported for various emission points, and 2) the modeling techniques. In order to ensure compliance with requirements of the Clean Air Act, BLM should evaluate methods for monitoring emissions from the source and require the source to limit emissions to those reported in the EIS. Emission limitations will be set for most pollutants by the PSD permit, but not all pollutants of concern are regulated by the Clean Air Act. Benzene and other toxic pollutants will not

19

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selected alternatives, (3) it fails to insure the scientific integrity of some data or methods used to obtain the reported conclusions, and (4) it fails to identify and assess reasonably available mitigation measures which BLM has the authority to require.

21

Dorchester Coal Company

United Reg. of Agriculture Bldg.
Room 300
8300 East Arapahoe Road
Englewood, Colorado 80112

Writer's Direct Mail Number
(303) 790-1644

May 3, 1983

Mr. Robert Kline
EIS Team Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, Colorado 81501

Dear Mr. Kline:

The Draft Environmental Impact Statement (DEIS) for the Clear Creek Shale Oil Project indicated that a 12,000 acre-foot reservoir is proposed on Big Salt Wash to provide water storage for the project.

Dorchester Coal Company presently holds three Federal Coal Leases (C-0127832, C-0127833 and C-0127834) which are located immediately adjacent to the proposed site for this water storage reservoir.

Construction of this reservoir at the site proposed would seriously impede Dorchester Coal Company's ability to develop these coal leases, especially the northernmost Lease (C-0127832).

Based on the information contained in the DEIS, it appears that the reservoir, if constructed at the proposed location, would inundate the only feasible location to gain access to both the Anchor and Cameo coal seams for Lease C-0127832.

The attached map shows the location of the outcrops of the Anchor and Cameo coal seams in this vicinity. It appears that portions of both seam outcrops would be covered by the proposed reservoir. The topography of the surrounding terrain indicates that the mine portals and surface facilities be located near the coal outcrops adjacent to the valley floor. Thus, construction of the reservoir at the proposed location could effectively eliminate all possibility of economically mining the coal contained in Federal Lease C-0127832.

Even if other access to the coal seam and alternative sites for surface facilities were available, the proposed reservoir site would completely cut off the haulage corridor to this lease and to Federal coal to the north. No haulage route, other than along the valley floor, is feasible because of the steepness

May 3, 1983

Mr. Robert Kline

of the surrounding terrain.

Inundating of the coal outcrops would also affect coal recovery on Lease C-0127833 and Lease C-0127834 by making portions of the coal adjacent to the reservoir unminable. The hydrostatic pressure created by the reservoir could also cause water problems in a mine situated on these leases.

Because of concerns expressed above, Dorchester Coal Company requests that the Bureau of Land Management reevaluate the site on Big Salt Wash as a potential location for a water storage reservoir. Dorchester is willing to cooperate fully with the BLM and the proponents of the project to develop an alternative that would be acceptable to all parties concerned.

Thank you for your consideration.

Sincerely,

B. L. Kline
B. L. Kline
President

BLR:D
Attachment

A Subsidiary of Dorchester Gas Corporation



DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, OFFICE OF CHIEF OF ENGINEERS
610 CAPITOL Mall
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION NO. 47

May 2, 1983

Regulatory Section

Cherron EIS Team Leader
EIS
764 Horizon Drive
Grand Junction, Colorado 81501

Dear Sir:

This letter contains the Sacramento District's comments on the Draft Environmental Impact Statement (DEIS) for the Clear Creek Shale Project.

The DEIS covers most of our concerns. However, we would like to have the amount of affected wetlands quantified in the Final EIS. We, as mitigation measures that are proposed to undertake the effects of wetlands should be included in the Final EIS.

Thank you for the opportunity to review and comment on the draft EIS.

Sincerely,

M. A. Dennis
M. A. Dennis
Chief, Distribution-Operations
Division

GARFIELD COUNTY CITIZENS ASSOCIATION

May 3, 1983

901 Blake Avenue
Glenwood Springs, CO 81601

Robert Kline
EIS Team Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, CO 81501

Dear Mr. Kline:

The Garfield County Citizens Association appreciates this opportunity to briefly comment on the Clear Creek Shale Oil Project Draft EIS. We have two general criticisms of the EIS. One, the description of impacts are imprecise and non-specific. Because analysis of the degree of impacts is cursory, cryptic or lacking throughout, it is difficult for the lay reader to gauge the level of significance of the various impacts.

Referring to paleontological resources on page 4-65, it states, "Overall, impacts are not expected to be significant under either scenario." On page 4-69, it states, "The effect of these phenomena on the soil resources is not fully understood, but preliminary assessments of existing data indicates that short-term impacts would be insignificant." On page 4-70, it states, "The water supply system would likely have a significant detrimental effect on organisms in the Colorado River as a result of direct losses from impingement and entrainment at the point of water diversion, as well as loss of downstream habitat from flow depletion." The use of "insignificant", "insignificant", "minimal significance", etc. has little meaning for us.

We appreciate the discussion of the Numerical Rating Impact System in Appendix B-1 and the assigning of numbers to impacts. But, for us, the rating system does not go nearly far enough in helping the reader to understand the rationale, the reasons for assigning those numbers to impacts. For example, on page 2-73, a 0.5 rating is given to Lower Dry Fork Reservoir for land use. We conclude from the table that all of the reservoirs are a beneficial land use, but of the six reservoirs Lower Dry Fork is the most beneficial by as much as 3.0. We have no idea why (1) a reservoir is a beneficial land use nor (2) why Lower Dry Fork is better than the others for this one factor.

Robert Kline
May 3, 1983
Page two

In your efforts to quantify impacts, it seems to us you have eliminated all of the discussion that would aid understanding how the various numbers were derived. In short, the rating system appears to be rather arbitrary. The reader, it seems, must accept the conclusion of "insignificant" or "insignificant" in good faith.

Secondly, the body of the R.I.R. does not go beyond describing inputs to discussing how those inputs can be prevented, avoided or mitigated. The listing of mitigation measures in Appendix C-1 is again superficial. We believe that they might more usefully be incorporated into the Environmental Consequence chapter of the R.I.R.

The mitigation measures in Appendix C-1 also seem to us to be goals rather than measures. Such statements as "maintain surface water flows and quality at Clear Creek Falls area," "avoid or minimize disturbance to talus slopes and cliffs in developing access roadway" and "prevention of underdrain clogging" reveal nothing about how surface water flows and quality will be maintained, how disturbance to talus slopes and cliffs will be avoided or minimized or how underdrain clogging will be prevented. What will be done specifically to mitigate or prevent impacts is missing. Quite probably, Chevron has developed specific plans that might answer our questions in some of the referenced material, but this information is not included in the R.I.R. We feel it should be. The mitigation measures instead use phrases such as "use routing" and "proper control". To be assured that plans are "safe" and "proper", we would like to know what they are in more detail.

In addition, while asterisks indicate that Chevron has committed to many mitigation measures, lack of asterisks suggests that Chevron has not committed to a majority of the mitigation measures. Does Chevron plan to commit to all of the mitigation measures?

We did not notice any mitigation measures for air quality. Are all impacts covered by the R.I.R., and other state air quality permits, including fugitive dust from any haul roads, railroad haulage, spent shale disposal sites, construction, etc.?

The following are more specific comments. They are examples only of the types of questions that we have; they are not all inclusive.

42

42

Robert Kline
May 3, 1983
Page three

Page 4-36: "The impacts on the drainage basin, water quality and water quantity would be minimal provided that an appropriate runoff diversion scheme around the disturbed area is planned." What is the appropriate runoff diversion scheme?

Page 4-40: From corridor construction, "soil erosion/sedimentation and stream flow disruption are expected..." What measures will be taken to prevent damage to wildlife, creeks and streams?

Page 4-40: "An accidental spill is a possible impact of the syncretic pipeline..." What will be done to prevent spill, and in the event of a spill, what actions would be used?

Page 4-41: "Approximately 10 percent of the mean annual flow of the Colorado River near Bismarck could be diverted." What aspects will be done to have an senior water users downstream?

Page 4-41: "...colloidy of the Colorado River at the Imperial Dam in the year 2011 would have increased by approximately 17.23 milligrams/liter... salinity would increase by 1.6 mg/l and 4.8 mg/l respectively." Would these increases create any problems and how severe might they be? Can anything be done to mitigate salinity increases?

Page 4-43: "The probability of failure of a specific dam is difficult to assess precisely; it is dependent on the conditions of dam design, construction, maintenance, operation and foundation materials." What is the proposed dam design, etc.? How difficult to have more detail, especially as the R.I.R. states, in case of failure would take 23 minutes for the 25 to 35 feet flow to reach Bismarck? We would also like to know more about the geology of the different reservoir sites.

Page 4-43: "It is expected that the ground water withdrawal would deplete the alluvial aquifer storage and mean Creek stream flow. The percentage of stream flow depletion would depend on recharge conditions, total pumping and Clear Creek flow." We would like to know the range of expected depletion of both the aquifer and the stream. What are the worst case scenarios?

Page 4-43: "...stream flow routed through the underground workings may be contaminated by contact with raw shale and other residues such as oil and grease, dust, and arsenic nitrate from explosives." What will be done to prevent this contamination, especially if it is to be returned to the natural water course?

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42

Robert Kline
May 3, 1983
Page four

Page 4-45: "Diverting the runoff through the underground mine would reduce the alluvial channel storage." How much might the alluvial channel storage be reduced, and is this a problem?

Page 4-46: "Appropriate design of an on-site drainage collection system and spill prevention plan should alleviate the potential impacts." Again, we would like to see descriptions of the on-site drainage collection system and spill prevention plan.

Page 4-47: "Potential surface runoff and soil erosion from the spent shale pile may pollute the reservoir water (Big Salt Wash) and stream flow." What will be done to prevent this? May we interrupt stream flow and degrade water quality in Hungry Creek? What will be done to prevent these impacts?

Page 4-47: "Impacts due to on-site disposal would include water quality impacts due to potential leaching and accidental spillage of hazardous waste from the disposal site. Surface runoff from the disposal site may also contain hazardous constituents." The treatment of solid and hazardous waste disposal is inadequate throughout the R.I.R. This is partially because no decision apparently has been made whether disposal would be off- or on-site. We would like to see a breakdown of what hazardous wastes are expected, a discussion of the range of possible impacts and prevention and mitigation measures.

Page 4-48: "The backfill placement of spoils would presumably be accomplished by a combination of truck and shovel, and conveyor belt techniques..." However, studies to specifically evaluate the resulting permeabilities of spoils placed by these methods are unknown. Does Chevron have plans to backfill spoils in a particular way, or does the R.I.R. presume? Will whatever method is chosen allow permeability?

Page 4-51: "If leachate encountered an open fracture system in the bedrock unit beneath the disposal site, the fracture system could transmit the leachate as confining flow to the aquifer below..." However, it is impossible to estimate leachate migration through confining flow due to the variable nature and occurrence of fracture systems at the site. We would like to know more about the fracture systems and how they are related to the R.I.R. It states, "minerals which may constitute faults are present at these locations." Is there any relationship between fractures and faults?

Page 4-51: "Should the liner fail, the concentration of sulfate, cyanide, ammonia and calcic/magnesium increase in the ground water due to leachate contact with the liner." We would like to know to be sure that the liner does not fail? If it did fail, what problems might the R.I.R. cause? How will the operator know if the liner has failed?

Robert Kline
May 3, 1983
Page five

Page 4-60: "The mean Creek corridor would be significantly impacted by cut-off operations related to access and construction." The road, etc., has apparently not yet been designed, but the possibility of slides both here and for the Big Salt Wash corridor sound high. We would like to know more specifically how the corridor construction will be engineered to prevent sliding, how cuts will be revegetated, etc. We would also like to know the basis and rationale for the conclusion: "Most of these disturbances would eventually subside and the long-term adverse impact should be slight given the geographic environment of the canyon," especially as it is stated that "this sliding could continue into post-operational phases."

Page 4-62: "The local use of sand and gravel in the corridor represents a beneficial application of the materials, since these deposits probably cannot be transported economically to existing commercial markets." The proliferation of gravel pits along the Colorado River Valley has been the most visible and one of the most significant environmental effects of oil shale development thus far. At one point, in the R.I.R., it is stated as though Chevron might rely on existing operations or ones that could be developed in the Colorado River Valley for construction material. Has Chevron committed to "the local use of sand and gravel in the corridor"? In general, what is the anticipated gravel demand in tons per year, and where will it come from?

Page 4-63: "Two small, northwesterly trending faults have been mapped near the proposed reservoir, one of which is located within the western portion of the proposed reservoir. This fact may adversely affect the integrity of the dam foundation unless proper engineering designs are employed to mitigate its potential effects." What features of the proposed design will support the dam's integrity?

Page 4-64: "The effects of these phenomena (combustion off-gases) on the soil resources are not known. This fact may have preliminary assessment of existing data indicate that short-term impacts would be insignificant. However, the long-term impacts? Are there bodies of water on the upland plateau which would be susceptible?"

Page 4-68: "Coal, sulfur, raw shale, or spent shale dust could be deposited on the soils along transportation routes during operation." What measures will be taken to prevent this?

Page 4-71: "However, if anoxic (oxygen-limiting) conditions develop in the deeper portions of the water, the water discharged from these levels, discharged water could be low in dissolved oxygen and high in ammonia and hydrogen sulfide (hydrogen sulfide). This condition could have toxic effects on downstream biota." If this condition should develop, what would be done?



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
1605 LINCOLN STREET
DENVER, COLORADO 80202-8699

Ref: BPN-EA

Mr. Robert W. Kline, EIS Project Leader
Bureau of Land Management
764 Horizon Drive
Grand Junction, Colorado 81502

Re: Draft Environmental Impact
Statement: Chevron Clear Creek
Shale Oil Project, Sanfield
County, Colorado

Dear Mr. Kline:

The Region VII Office of the Environmental Protection Agency has reviewed the above referenced document. The attached comments are for your consideration in preparing the Final EIS.

EPA has been pleased to have had the opportunity throughout the scoping process and the drafting and review of the Preliminary Draft Environmental Impact Statement, to provide detailed comments and assistance at each stage. Many of the environmental concerns related to the project were addressed during this pre-EIS coordination.

In general, the DEIS contains inadequate information on process waste streams and potential controls to properly evaluate whether all impacts have been identified and mitigation measures adopted. We recommend that these deficiencies be corrected through appropriate means and issued for review prior to preparing a Final EIS. Because of the above deficiencies we are required to rate this DEIS as Dis-2. (This means that EPA has environmental reservations about the impacts of the proposed projects and that the EIS should contain additional information, as outlined in our detailed comments, to assist in determining the extent of environmental impact.) We appreciate the opportunity to review this document. If you have questions, please contact Mr. Mike Hammer (715 387-2351) or my staff.

Sincerely yours,

Steven C. Duran
Steven C. Duran
Regional Administrator

Attachment

44

44

EPA'S DETAILED COMMENTS ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE
CLEAR CREEK SHALE OIL PROJECT

Section	Page	Air Quality
2.3	2-85	Table 2.3-6 indicates that 250 ppm SO ₂ emission in the tail gas is BACT. This level of control does meet the NPS emission limit for sulfur recovery plants. However, some additional control might be achievable.
2.3.2.3	2-22	At this stage, the information presented in the DEIS can only be considered suspect with regard to sulfur emissions. This opinion results because the information presented regarding the retrofit sulfur balance is incomplete and the sulfur balance does not close. The data presented and the sulfur balance, of 3,556 tons/year and 1,988 tons/year, Table 2.3-4, Emissions From Upgrading Facility, page 2-29. No information is presented regarding the quantities of sulfur removed by the sulfur recovery plant process, by the spent shale, or contained in the water streams. In addition, there is insufficient data for the retrofit gas stream and liquid product recovery. For example, the stream labeled Product Gas in Figure 2.3-2 is not characterized.
2.3.3	2-37	The proposed action (PA-100) involves mining, retorting and upgrading, all taking place at the Clear Creek Penna site. The summary fails to recognize the significant impacts on air quality which include violations of the National Ambient Air Quality Standards (NAAQS) for nitrogen oxides and for particulate matter (24-hour). PSD criteria for the annual and 24-hour SO ₂ and the 24-hour TSP impacts are consumed or exceeded. These show adverse air quality impacts would occur for the CC-100 alternative.

44

44

Section	Page	The draft EIS fails to recognize these adverse impacts or to discuss what mitigating measures could be used to reduce them.	Section	Page	The program being considered has costs approaching \$1 million per sq. ft. reduction in salinity. In anticipation of increasing salinity control costs, prevention and/or mitigation become increasingly important. In particular, recognition of this factor, the seven basin states, through the Colorado River Basin Salinity Control Program, adopted a policy to encourage the industrial use of saline waters in lieu of higher quality water wherever practicable. DIT shale development, especially the use of saline water for compaction or processed shale would appear to be one of the more promising areas for the implementation of this policy.
2.4.11	2-86	The proposed action, PA-100, is not the configuration which Chevron has submitted in their applications to EPA for a PSD permit or the Colorado Air Quality Control Division for a State Air Quality permit. The received application configuration is more like the Fruit 1, PT-100, alternative.	2.3	2-36	How will runoff which collects on the benches of the retorted shale disposal site be handled?
2.4.3	2-81	PA-100 and CC-100 also indicate exceedances of the PSD increments and the 24-hour NAAQS for TSP.	2.3	2-34	Disposal of process or non-process wastes in the processed shale disposal area need to be more fully described to determine adverse impacts that could result from such disposal.
3.11	3-71	Why were the Dinshaw N.M. and the Mt. Zirkel wilderness areas not included in the discussion of wilderness areas?	4.4.2.2	4-49	Mining Activities (PA-100, CC-100) contains a very general discussion of dewatering activities and potential water quality impacts. More quantitative information is necessary to address the actual processes and potential mitigation components. The EIS should specify, 1) the total rate of the dewatering operation, 2) the specific water quality characteristics of the water derived from dewatering, 3) the rate of the dewatering discharge (i.e. discharge to surface, total containment, use for process water, dust control, etc.).
4.2	4-15	When considering cumulative air emission impacts for the region, the project should be analyzed at 90,000 bpd rather than 10,000 bpd. Union has invested over \$100 million in the Long Ridge project and chances for expansion to the full 90,000 bpd are as great as the production rates used for other projects considered.	4.4.2.2	4-52	The DEIS acknowledges that solution via geochemical interaction would result in higher TDS concentrations. This impact should be quantified for total dissolved solids and also for individual ions. The impact on the underlying ground and surface water systems quantified. Opportunities to mitigate adverse water quality impacts should be discussed in the EIS.
4.2.1	4-2	The dispersion models used in the air quality impact analysis have been accepted by EPA for certain uses. However, these models are not officially EPA approved models.	4.4	4-48	Shale Disposal/Reclamation
4.4	4-42	Water Quality Salinity is the major basinwide water quality concern in the Colorado River Basin. The Department of the Interior estimated that annual salinity damages in 1982 were \$110 million and would rise to \$326 annually by 2010 in the absence of salinity control. A 1 mg/l increase in salinity measured at Imperial Dam causes approximately \$300,000 in increased damages. To comply with the Colorado River Basin Salinity Control Act (PL 93-230) and existing Colorado River salinity standards, numerous Federal Agencies (EPA, USRA, USF, SCS, ARS, etc.) and the seven basin states are seeking to implement cost-effective salinity control measures. Many of	4.4	4-51	The final appearance of the backfilled surface mine is unclear. Since some material (from the first cut) is not returned to the surface mine, is there enough material to fill the pit?



-4-

Section 700

- 4.4 4-55 It is not clear that the cover design proposed by Chevron will prevent infiltration into the processed shale disposal in the Clear Creek drainage.
- 4.4 4-56 EPA leaching tests (as well as tests by others) indicate that alternate cycles of saturation and draining produce leachates that do not have a sharp drop in dissolved salts.

Additional Comments

- 4.14 4-162 It would be helpful if Figure 4-162 were modified to show all the projects listed in Table 4-161. Although page 4-161 says that cumulative impacts were considered for projects shown in Figure 4.14-1, just Table 4.14-1 included projects not shown on Figure 4.14-1.

MINUTES
PUBLIC HEARING
BUREAU OF LAND MANAGEMENT
CHEYRON CLEAR CREEK OIL SHALE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

April 4, 1983

Bureau of Land Management Office
754 Harrison Drive
Grand Junction, Colorado

PUBLIC HEARING
BLM/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 6

JEAN MARTINEZ (continuing):

companies taken into consideration the fact that they may have to do something in a matter of self preservation because you can't always depend on what some of the hunters will do. Those are the things that come to my mind. As I say, it is not that I expect answers tonight, but rather as something else to think about. Thank you.

45

LARRY PORTER: O.K. Thank you for your comments, Jean. George Foadick is the next person indicated to speak. Are you representative yourself?

GEORGE FOADICK: Yes sir. My name is George Foadick of 630 Beaton Court in Grand Junction, and tonight I represent myself. And because of ... that I know several people in the audience that know that I am employed by the energy industry in the area, so my remarks may hit you by surprise, but I want you to know that they are entirely genuine.

46

I want to confine my remarks tonight solely to Options Fruita One and Fruita Two on Air Quality. I am in favor of co-development of this EIS, but I am also an aesthete, and I am concerned with air pollution in our valley here. An aesthete doesn't ... most often does not know the sources of his troubles, whether it be air exhaust or wood burning stoves or a neighboring refinery or nuclear nature. And our mother nature is a big culprit of fugitive dust and so they contribute to our problems in a large extent. In our area here, our problems are worsened in the winter time from atmospheric inversions and the impact assessment shows that Grand Junction is one of the highest frequency areas in the nation with regard to winter time inversion. And, just in passing, I might note that the statement does admit that the Grand Junction and Fruita area is currently non-attainment for particulates. I would like to make some suggestions

PUBLIC HEARING
BLM/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 5

LARRY PORTER: Thank you, Bob. There are some additional speakers. Would you like to come up to the mic (microphone)?

As I mentioned a few minutes ago, there have been several of you come in since, and we have three speakers lined up on the register to speak, and after we go through these individuals, I will see if there are additional people who would like to speak, so we will get to all of you this evening.

At this time, I would like to proceed with the public comments on the subject Draft Environmental Impact Statement, and so that the Court Reporter and all say hear, those who are presenting testimony, I would like to have you come up to the speaker's podium and make your comments from the front ... if you will do that, please. And also, it would be helpful if you would state your name and address clearly for the record at the beginning of your comments.

The first person on the Speaker's Sign-up Register is Jean Martinez, and I am assuming you are representing yourself with your comments?

JEAN MARTINEZ: Yes, as a private individual, and for your records: I am Jean Martinez, my address is 3305 P-5/8 Road, Clifton, Colorado. My concern ... I have several questions, not that I expect answers to, but rather as something else to think about. When this originally was presented, it was stated that there would be access roads built up the Roan Creek area, roads which will open up BLM land which is not now readily accessible. And the questions that have come to my mind are these: Is that going to allow the general public into areas which are not readily accessible, and if it does, what about the time between September and November when big game hunting is in season. Will hunters be allowed into the BLM lands where they can't now very well see into. And conversely, during that time, have the

45

PUBLIC HEARING
BLM/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 7

GEORGE FOADICK (continuing):

for more data in the document, particularly in regard to meteorology. I would like to see some proof that the ... with regard to the prevailing winds in the valley, that I know that must be upwind, up-down, up-down river for the most part, and I would just like to see some wind rises in the document itself. The way it is written it is not self-contained, it alludes to other documents that the reader probably doesn't have in his possession. I would like to see some estimations of the inversion heights and mixing layers. I would like to see more data on air quality. I didn't see any data beyond ... most of it was 1980 or before. I would like to see 1981-82 data in Grand Junction on all the criteria pollutants. And, I would like to suggest that the EIS would be strengthened if you ... the project can move that size plume do not become entrained below the inversion layer.

46

The next major category of suggestions would be ... I think that the Fruita Options would be strengthened if the documents showed increasing controls on particulates or increasing stack heights so that both the Fruita Options could comply with air standards. Statements are in the document right now that they do not comply for particulates.

And finally, I would like an answer to a question ... What is the relationship of the existing Gary Western Refinery to this or other proposed oil shale projects. Are there any major modifications envisioned for this existing refinery, or is it envisioned to be entirely separate from all the developments contained in the EIS. Those are my remarks, and I thank you very much for the opportunity to make them.

LARRY PORTER: Thank you. Bob, do you have any clarifying questions for Mr. Foadick?

PUBLIC HEARING
SLN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 8

ROBERT KLEIN: Yes. Your comment on the prevailing winds...
You said they were up or down river?

GEORGE FORDICE: Both, depending on the time on day it can go both ways, and my concern is when they are headed toward Palisade, I would on occasion I have noticed... I won't call it a storm cloud, but the air is discolored up against the Bookcliffs and I would suspect that that would be the area where one might have more trouble under inversion. I would expect that the air slashes back and forth under this inversion and for several days there is the possibility of a problem there, and I would suggest the SIS address itself to that.

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ROBERT KLEIN/LARRY PORTER: Thank you!

LARRY PORTER: The next person signed up to speak is Sandi Knudson, representing the American Lung Association of Colorado.

SANDI KNUDSON: I have no prepared statement.

47

CAROLYN BRENNEMAN: May we have your address please?

SANDI KNUDSON: Yes, you want my office address if I am representing one of interested parties?

CAROLYN BRENNEMAN: Yes, Please.

SANDI KNUDSON: 576 25 Road #12, Grand Junction, Colorado.

CAROLYN BRENNEMAN: Thank you.

PUBLIC HEARING
SLN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 10

RUTH HUTCHINS (continued):

someplace in the vicinity of Clifton...or just west of Grand Junction and keep it to the base of the Bookcliffs out of the valley entirely. And your railroad could come from Mack and it could go east as was proposed for the Ute Power Company and possibly Dorchester. As you are talking heavy industry, it seems to me that you could have a heavy industry truck/rail corridor...totally stay outside of the valley property where the people live and out of the agricultural area. I guess basically what I would like to say, I don't think we have to use...you will have to re-do the roads anyway, so you might as well make new ones. And also I think that the company should pay for them, the companies involved...and before they start work they should put money into a big escrow fund to show their real intent. It's all so...because of the extensive nature of this whole project, if it should go into the 21st century, which is probably when it will start, it's not gonna be wiped out in one day, so they have to be looking at it so they might as well look at the Bookcliffs.

48

LARRY PORTER: O. K. Thank you, Ruth. Are there any others present who would like to make comments for the record? Connie?

CONNIE ALBRECHT: I am Connie Albrecht, I am with Friends of the Earth, 530 Main Street, Grand Junction, Colorado.

49

CAROLYN BRENNEMAN: Will you please spell your last name?

CONNIE ALBRECHT: Albrecht, and I am representing Colorado Friends of the Earth this evening.

CAROLYN BRENNEMAN: Thank you.

PUBLIC HEARING
SLN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 9

SANDI KNUDSON: I do not have a prepared statement. I have just a few comments. We also share the concern that there are statements in the Impact Statement that the particulate standard might be violated. The American Lung Association has long been interested in that particular standard. First of all because there has not been a standard for the small particulates that can be inhaled into the respiratory system. These are those kinds of particulates that can affect people who have asthma, people who have emphysema and people, particularly young people whose immune systems are not yet developed, so we also are concerned with the possibility of exacerbating that in the Fruita Option, and we would like more information on possible health effects, both of the particulate and sulfur oxides.

47

LARRY PORTER: O.K. Thank you, Sandi.

ROBERT KLEIN: No, no questions.

LARRY PORTER: Thank you very much. I went to ask at this time whether or not there are any others present who would like to speak for the public record on the adequacy of this Draft Environmental Impact Statement? ... I don't ... O.K.

RUTH HUTCHINS: I am Ruth Hutchins, 1574 L Road, Fruita, Colorado. I represent Family Farms. O.K.

48

CAROLYN BRENNEMAN/LARRY PORTER: Thank you.

RUTH HUTCHINS: On the Fruita Option, I can't understand why you have to make use of 16 Road or just west of 16 Road as a truck corridor at all. I can't understand why you can't hit the Interstate

PUBLIC HEARING
SLN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 11

CONNIE ALBRECHT: Overall I find the Chevron EIS quite informative and probably one of the more detailed EISs that I have come across. I am, you know, very impressed with the scope of EIS and their type of information, the up-to-date information that is included. I feel the impacts are somewhat downplayed and soft-modified, particularly the cumulative impacts that I think we would find from such projects. And, I would like to comment on a few sections in this. I have been studying this, but I am not prepared tonight to give detailed comments. We are probably going to have some other urgent file comments on such things as air quality, socio-economics, this type of thing. I just want to hit a few high points tonight.

As far as the air quality, I am in no position as I mention to you, to analyze your models. But one of the things that I notice is coming back over the academic comments that were submitted is that secondary emissions were raised by citizens during scoring, but I don't really think they were adequately dealt with in the EIS. For example, Section 4-2-7. There is a conclusion that secondary impacts would have little impacts on regional air quality. And there are some localized CO or CPM might occur, although none were created by the model. And I suspect what Albrecht rather than going by models which in this case is what the EIS does, that we should look some inherent air quality information, and specifically from the air quality problems. And I think you will see that we have had an increase in air quality deterioration over recent years. I also have difficulty with the fact that there is not much projection about the fact that the population brought in by the project would lead to a deterioration in air quality. For example, you have more people, and in this case we are talking about thousands of people. We can have more construction and wood stoves and cars. And even ... the valley as a unit. So Chevron's

49

PUBLIC HEARING
NAN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 12

CONNIE ALBRECHT (continuing):

project, especially the pops ... you know, in addition to your actual project, your population you are bringing in is going to have quite an impact, so I am suggesting you use some reality test to see what the current violations and deteriorations are and check with some of your models.

As far as your agriculture, I don't think you have enough emphasis on the impact of agriculture in the EIS. Beyond just doing an estimate of farmland that would be lost through direct disturbance by the project sites, I think that you should look at something of a prototype oil shale leasing EIS did where they made some estimates of farmland loss from the induced growth and development in the area. In other words, the urban sprawl that is going to accompany such a project. Especially given a lack of land use regulations around here.

Another category ... I was quite impressed with ... that was the endangered species portion of it. I thought that your description of the species present in the region was one of the more detailed that I have seen. I didn't find ... and maybe I just couldn't find it ... in going through here, is that I don't find too much of an analysis on the impact of the crisis on the specific species. There were a few paragraphs, but not a lot of detailed analysis, and there is also a statement in here that quoted "is anticipated that information available to Fish and Wildlife Service will allow them to further refine both the probability and magnitude of the impact" and I would like information on what that means. Are you anticipating a study that's now in the works or exactly what is the situation?

PUBLIC HEARING
NAN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 13

CONNIE ALBRECHT (continued):

corridors. And I really would like to see the EIS find out the purposes for these corridors. For example, how wide, you know, they are multi-purpose, but there seem to be a lot of variability from section to section about just exactly what the corridors will be used for. I would just like to see a fuller analysis of the corridors. And for, you know, in terms of the environmental impacts. I suspect it probably would be less disturbing to run the corridor up through Roan Creek rather than having one in the valley where your population is more, but I really have to look into that. I am going more at this point on air quality. I cannot give you all the specifics on air licenses, this type of thing. Overall, I just question why we have to hurry here to approve a 100,000 barrel per day project in whatever configuration and the BLM uses an interesting rationale saying that it would make a greater contribution than the 50,000 barrel per day rate. And furthermore, it would be in accordance with your regulatory responsibilities to manage the federal lands to best meet the present and future needs of the people. Well, I would dispute that giving rights of ways for 100,000 barrel per day oil shale project is the best way to manage this particular federal land to meet the future needs of the American people. We aren't even sure in thirty years if America is going to need oil shale, and so I don't think there is any great hurry to pass out right-of-ways to Chevron or any other oil shale project. Especially when Chevron's own annual report says that shale will not even be economical until the late 1990's.

In wrapping up here, I would like to say that I think there needs to be some...the sections that are summaries...the Environmental Consequences Section and the Mitigation Section all need to be beefed up and they need to be more detailed, but also, I think that

PUBLIC HEARING
NAN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 13

CONNIE ALBRECHT (continuing):

Regarding your spent shale. You know, and usual Friends of the Earth has questions about the entire feasibility of disposing of spent shale since it really has not been done successfully on any kind of scale. And I think this is one section in your EIS where you can really beef up and look at doing some better diagrams and this type of think to show what will be done with the spent shale and what kind of problems ... you anticipate some problems, but you don't really go into detail about how to take care of them. One of my major criticisms of this EIS is that I think the 50,000 barrel per day alternative is really slighted and I think it should be more thoroughly looked at, rather than its incredible reliance of 100,000 barrel per day projection. And I don't think that it is the BLM's responsibility, in effect, to approve a 100,000 barrel per day facility. I think we are looking at a project that is far in the future and there may be many things we find out about spent shale between now and the time that Chevron actually does the project. Therefore, I think we need a better analysis for 50,000 barrel per day production rate. And, I know we did not find that in here. So I would like to see that and, ... just sort of develop out those old traditions.

One of the other things that really was disturbing about this EIS was the fact that there are these corridors. And honestly, depending on which alternative you use, you know, there is going to be some difference in corridors. At this point we will favor an alternative which would use only one major multi-purpose corridor rather than having two. I find very little justification or analysis in this EIS for the use or the building of two major

PUBLIC HEARING
NAN/Clear Creek Oil Shale Project
Draft Environmental Impact Statement (DEIS)
April 4, 1983
Grand Junction, Colorado
Page 15

CONNIE ALBRECHT (continued):

we need a better summary than is in plain English. You know. A lot of this stuff does get into great detail and references a lot of other documents, so we need a couple of pages that are just a nice, you know, easy reading, summary. Because people are quite confused. I found a lot of the different alternatives and what the different impacts would be for the different alternatives.

I did forget one thing. Obviously, having a Fruita Alternative where you have the operating site in the Fruita area ... as far as the spreading of the tax revenues. And that is one thing that is fairly obvious about the idea of putting part of the facility in Fruita, and part of it in Mesa County and the remaining portions of the facility would be in Garfield County. However, you know, this one would have a number of problems including, I think, the deterioration of air quality in the valley. And I am not interested in living in the valley if it is going to look like Denver. I have asthma too, and I'm not anxious for that breathing stuff. So, I think that the Fruita Alternative really needs to be looked at more closely in terms of the impact on the health and welfare of the people in Mesa County, because I think that at this point maybe we can't project it, but I think that in the future, hopefully, we can make government arrangements so that tax revenues can be equitably dealt with and so Mesa County might be able to work out an arrangement where they get mitigation money. Even though the facility may end up being located in Garfield County. So I don't think that the BLM should rush to also put ... have an alternative that has based part of the facility in Mesa County. Any questions?

LARRY FORZER: Do you have any questions, Bob?

ROBERT KLIEB: No.

CONNIE ALBERTSON: Thank you for the opportunity.

49

LARRY PORTER: Thank you, Connie. Are there any others present who would like to make a statement for the record this evening? I would like to remind you that this is the first of four hearings that will be held on the adequacy of the Draft Environmental Impact Statement. Tomorrow night will be in Durango, Wednesday night in Rifle, and Thursday night in Denver. And also, reminding you once again that we will receive your written comments until May 3, 1983. If you will address them to Bob Klein the Team Leader here on the EIS at the Grand Junction District Office.

If there are no further speakers this evening, I want to thank you for coming.

Bob Klein is the Team Leader for this Environmental Impact Statement will be here, also Scott Harnett with the consultant who prepared the EIS under BLM's direction and Mr. Berstoft and Mr. Fisher from the project components, I see are here, and hopefully will be available to discuss any of your questions after the meeting.

If there are no further comments, then I will like the record to show that this Public Hearing was concluded at 8:14 p.m. Thank you very much.

Respectfully Submitted

Carolyn Brenneman
Court Reporter

PUBLIC HEARING

BUREAU OF LAND MANAGEMENT
AND
CHEVRON CLEAR CREEK SHALE OIL PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

APRIL 5, 1983

Durango High School Auditorium
Durango, Colorado

STATE OF COLORADO

COUNTY OF MESA

I, Carolyn Brenneman, certify the above transcript is true and correct to the best of my knowledge.

Carolyn Brenneman
Carolyn Brenneman

Signed before me this 29th
day of April, 1983.

John Deal
John Deal
Notary Public

My commission expires September 27, 1983.

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
Durango, Colorado
April 5, 1983
Page 5

DALE B. ALBERTSON: Well, Larry, I have to apologize. I didn't realize it was quite this formal. 50

LARRY PORTER: We are trying not to be too formal tonight, Dale.

DALE B. ALBERTSON: I just read where there was a public meeting and that has the connotation, I guess of being more or less formal. My name is Dale Albertson, I live in Kimball Creek.

CAROLYN BRENNEMAN: Is that Kimball Creek, sir?

DALE B. ALBERTSON: Kimball, yes. I have one of those government addresses, but I try not to use it (laughter). I have basically about three things, I guess. And I don't know, I say ... if you want to call me out of order if I get on to something else, feel free to. I don't think that the Draft EIS adequately addresses the Moon Creek Access Road. It to me is very vague as to what you are proposing and the few comments I have on what I think it should contain is probably a 4-lane road for the activity ... Chevron's activity when you ... because I don't think we can look at just Chevron, we have to look at Chevron's specific project and 8-10 other oil companies that possibly can develop. So, I think when you look at the overall planning process, I think we have to look at not a 2-lane road for you and then a 2-lane road for Pacific and on down the road. I think we need to look at it all right now. I think in addition to a 4-lane road, I think we need a frontage road or a community road that would take care of the agriculture activity that takes place up and down the creek. If you come here the right time of year, you will find hay wagons and bail wagons and in the winter time you will find hay wagons going

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
DeBeque, Colorado
April 9, 1983
Page 7

DALE B. ALBERTSON (continued)

up and down the road. There needs to be somewhere for that activity to take place. Also, livestock guide-vogues could use the same community road or frontage area to be used for livestock driveways. And there are a lot of cattle running up and down this Roan Creek Road. Now many there will be after all this activity takes place I wouldn't know, but I think we have to plan for what's happening now. And we definitely do need a way to move our livestock. This road could also be used as a school bus route. We can't be confined to a 4-lane road with all the oil shale activity and run school buses. There needs to be a separate road.

Now, you are talking about a railroad also. And some combination of this 4-lane road and this railroad should be. I think fenced with a game fence to eliminate the deer kill that is obvious if this is not done. I think the community road own either be included in this or left alone. We have learned to drive around through them. And, once in a while we get one, but not very often.

That kind of sums up what I feel is the problem with the road. And, I don't feel that the environmental statement addresses in detail the effect in the mitigating measures in regard to both Chevron's use of surface ground water. And this is they relate to damaging the water rights of land owners between Dry Fork and downstream Clear Creek and Roan Creek.

There is some reference made on page 228.... I believe that is the one I want. No that wasn't it. The comment I had, I didn't even know what it meant. But it says "other potential sources of water

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
DeBeque, Colorado
April 9, 1983
Page 8

DALE B. ALBERTSON (continued)

As far as transporting coal up this Roan Creek with trucks, 450 trips per day. Surely the Bear economy of this would eliminate it. Maybe you have to address it. I would hope that that would not be the case. I would hope that a railroad or something along that line. There is going to be a railroad serving Pacific probably anyway. I would think this would be a logical way to make one train trip a day and limit the 450 trucks, if I read your statement right.

I might back up just a little bit on this road. Along with the game fencing, I think there has to be adequate amount of underpass so the livestock can go under it, and also the game.

Now, I want to say a little bit about... if I read what is being said around the hills right ... and it looks like it boils down to maybe the Clear Creek alternative versus Fruita One. As I look at the maps that are provided in the draft, you look at the Clear Creek configuration and then look at the Fruita One configuration... it appears to me that the BLM was given two directives. Make one alternative that is as conservative and disturbs as little of the environment as possible and then drop another one that tears up as much of western Colorado as you possibly can... and then the Fruita One. Being's as I can't talk off my cuff too well, I will read what I have written down.

Fruita One destroys the only area I know of that has anything left in the area of altitude, undisturbed natural beauty. It is primitive, if there is such a thing any more. And probably some of the best mile deer hunting there is. You are proposing and saying that you even prefer to use this alternative that will

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
DeBeque, Colorado
April 9, 1983
Page 8

DALE B. ALBERTSON (continued)

for the Clear Creek Project are ground water and surface water in other valleys adjacent to Clear Creek and Roan Creek". That I didn't understand.

Pages 229 and 230 go into all the details of the 13 wells that Chevron has in Clear Creek and 4,000 gallons per minute that visualize pumpline. And, uh, I don't believe that you adequately addressed what effect that is going to have on the water rights of the people directly down stream from that. You have made some allowance for pumping water into the reservoir and fill those early lots. These #1 and #2 the reservoir ditch and the That's probably adequately addressed in here, but I don't see anything that relates to what's going to happen to the ones that are newly affected by those wells.

Pages 237 and 38 refer to revegetation plans that you are going to require that Chevron do. Now if it, I believe, is probably pretty consistent with sound range management. Then we get off into requiring that they plant big sage rabbit brush, surface berry and of all things, oak brush. The BLM also has several range improvement projects right in the immediate DeBeque area to start to eradicate all the above mentioned junk. So I can't see the logic in requiring that they plant these. I guess by seedlings, maybe seed too. It is an expensive thing. On one and you require them to plant it, and coming out of the same office in Grand Junction, on the other hand, saying we are gonna burn it and try to get rid of it. A gross inconsistency. There have been tens of thousands of dollars spent by the ranchers, the PCS the APGS and the BLM and others controlling growth of these plants. And now I see you turn around and tell them they have to turn around and plant them back.

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
DeBeque, Colorado
April 9, 1983
Page 10

DALE B. ALBERTSON (continued)

Destroy all those attributes. I am sure this is not desirable when there are other alternatives that confine the activities to one area. Head County's desire to have a piece of the action surely can't justify disturbing and destroying this huge area of western Colorado. In this, I am talking about Salt Wash come clear down the top around the head of Roan Creek, around the head of Brush Creek clear to Clear Creek. You've got proposed for coming over the top with an inter-tie pipeline into the head of Roan Creek, coming down to the confluence. You're just about around the bulldozer into every place of it up there. If that were the only alternative ... if that were the only way of getting it out it would be one thing, but it isn't. Confining your activities to the Roan and Clear Creek valleys is essential, we can't justify tearing out and nonpolluting any more of our area than that.

As I get in from riding fields and checking calves, guess that is all I had time to write down. I have got some other thoughts, but for the time being I will just let it go at that.

LARRY PORTER: Well, please if you do intend to write them down, get them to us and we can consider them in the same way we would your verbal comments tonight.

DALE B. ALBERTSON: O.K.

LARRY PORTER: Seb, did you have any clarifying questions?

BOB KLEIN: No.

LARRY PORTER: O.K. Thank you, Dale.

LARRY PORTER: The next person signed up to speak is Bill Prather.

51
BILL PRATHER: I am Bill Prather. I live here in DeBeque. I am a rancher. I am a member of the Colorado Cattlemen's Association Environmental Committee and I am really concerned with the environment of the ranch. But I am not an authorized speaker for them at this time. I want to thank you for holding this meeting here and giving the people a chance to understand what the proposals are and comment if they want to. I only hope that somebody somewhere pays more attention than they have to the many others who have presented testimony on many other things. A little example of that is a little bunch of wild horses out here. We spend all one winter driving to Grand Junction and developed a plan where the wild horses could have some, livestock could have some, wildlife, motorcycles, everybody was not ... nobody was happy, but nobody was unhappy. They sent it to Denver and you couldn't tell we ever had a meeting when it came back. Nobody was happy when they got back. So, I just hope this turns out a little bit better than some of them have.

The second thing I want to say is I certainly do agree that this country has absolutely no alternative except to develop more ways to make ourselves energy self sufficient. We are really subject to blackmail the way we are today in all our works. They shut that energy off over there, this country would come to a screeching halt, and I think most of us would find our way of life gone. I dare say in six months. So, no matter what we have to do, we have to do to get some energy from some place. I do hope we can do it with the very least destruction that we can. Enough producing now. I will get on.

BILL PRATHER (continued)

51
something, letting those wildlife people come up. Oh, we got to take care of these things which shouldn't be here in the first place. And the taking care of reverts back to they take more of my property, my grass or my hayfields to do it with. And I think this ought to be addressed as part of these overall impacts. It is hard to center on just this one, because they are all mine to have to come together. But I don't believe there should be any mitigation for the wildlife habitat loss where that habitat is on private property in the first place. And I tell you how it came to be there. About 20 years ago the Chambers of Commerce and everybody was looking at recreation to bring some income into Colorado. And God knows we needed it. And they looked to hunting. In order to increase the hunting they looked for more game and therefore, more habitat. And they went to the landowners and they encouraged us to leave ditches for the quail and the pheasants. Don't burn them. Leave trees for the eagles, leave vegetation around for the deer and the elk. All right. We did. And they built them a way up, and now they darn near put us out of business and they are confiscating our land. And I feel like I have been played for a sucker, because I was one of the people who promoted that. And I sure got caught in it. Here is just a little example. We let the eagles and the herons use a little of our river bottom. They weren't really hurting us much. And my reward was they took 1.9 acres of ground for a highway and they confiscated 50 acres to replace the habitat loss on that 1.9 acres that was mine in the first place. Another instance out here the land owner was real good. We let the recreation people go across and hunt and fish and about 15 years later they came in and said "Oh no, that's a public road now right across the middle of

BILL PRATHER (continued)

One of the main obstacles I see with all this energy development ties right in to an obstacle that is here anyway. And that is the management by the BLM of these isolated tracts. They are absolutely a pain in the neck for the BLM and they are a pain in the neck for the land owners that own some of the BLM. We have been trying to trade them for 20 years, and apparently the applications are all in some waste basket somewhere...well I take that back, they've been shredded now. Maybe this Environmental Impact Statement might be a way we can impress on some of those people that that should be a priority in this thing. Let's get people isolated tracts settled once and for all so that we can manage this area. Most of the property land owners can build.

51
The next thing I want to address a little bit is the wildlife. I think it ought to go in here that an awful lot of concern for the wildlife. Most of that concern comes right back on the local residents to make up the loss that might come from energy development. I want to remind you that it wasn't very many years ago, I dare say 20, there wasn't over 50 head of elk in the Roan Creek drainage. Now I don't know how many there is, but there is probably 500 in there. We got a bunch right across the valley out here and that's part of this impact statement too, because the people are gone live here and it's absolutely disastrous when they'll build up two or three hundred head of elk and stick them in a valley over here like this across this river. And the deer population... I didn't use to have 20 head of deer from the Dry Fork to Kimball Creek, and I can bet you can go up there tomorrow morning or in the middle of the afternoon or anytime else and count up to 500. And those things eat on our private land. And what makes it real disgusting to me is whenever you folks come in and start to do

BILL PRATHER (continued)

51
your land because you've been letting the public use it." They didn't pave it, they didn't do anything, they won't let us close it. When the runs get deep there, they just pull around the side. And I don't believe this statement should allow that those wildlife people to come in here and make a sacrifice out of all the local residents because all shale is going to come in and disturb some of these wildlife, plants and stuff. I feel that is one of the real important things that ought to be addressed in this. Because you are just continually making sacrifices telling the oil companies that the local people can make up for this wildlife habitat and I don't believe we should have to pay for this. We have spent a fortune, and for the same amount of money they can go in there and improve vegetation five times instead of obliterating asparagus. I admit I am too old to speed read, I have learned before, but I am too old now, and you have a lot of numbers and maps, not much sense I can make out of it. The Cattlemen's Association will get someone that will make further comments concerning this on all of these things. There are state statutes on stock drive areas with the State of Colorado and Roan Creek Road is designated as a protected stock drive area. I might remind this hearing that this is state law and should be checked into further. Another access road might be looked into.

LARRY PORTER: Thank you, Bill. Do we have anyone else who would like to enter comments into the official record?

I do want to thank Bill and Dale for their comments and we will give them consideration. Also, as I mentioned earlier, we will

STATE OF COLORADO

COUNTY OF MESA

I, Carolyn Brennenman, certify the above transcript is true and correct to the best of my knowledge.

Carolyn Brennenman
Carolyn Brennenman

Signed before me this 26th
day of April, 1983.

Harry Potter
Harry Potter

My commission expires September 27, 1983.

PUBLIC HEARING

BUREAU OF LAND MANAGEMENT

AND

CHEVRON CLEAR CREEK SHALE OIL PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

APRIL 6, 1983

Rifle High School Auditorium
Rifle, Colorado

Public Hearing
BLM/Clear Creek Shale Oil Project (DEIS)
Rifle, Colorado
April 6, 1983
Page 2

LARRY POTTER (continued):

We have at this point received no indication on the sign-up sheet that anyone is interested in presenting oral comments at the meeting this evening. And, I will ask again at this time whether or not any present would like to, for the record, enter comments into this Hearing?

O.K. Uh, therefore, I will proceed with a couple of other comments which I have. A reminder that you may submit written comments to the Bureau of Land Management until May 3rd, 1983, and your written comments should be directed to the Chevron EIS Team leader, who is Bob Klefs seated at the front table at the Bureau of Land Management
764 Horizon Drive
Grand Junction, Colorado 81501

Now any comments which you submit which are recorded as part of the hearings, or which are received in written form by our office which pertain to the adequacy of the Impact Statement or present new data to us will be addressed in the Final Environmental Impact Statement.

At this time, since there are no people who would like to enter official comments into the public record, I will thank those of you who attended. I do appreciate your coming out. I know a lot of you traveled quite a distance to get here, and remind you of the possibility of written comments, should any one of you have so desire later.....Yes sir?

(Unidentified man): Sir, in the direction of comments, I have two questions tonight, are we closed on that subject?

LARRY POTTER: That, that is something that we have people here who can work with you on, and we will be happy to work with you

STATE OF COLORADO

COUNTY OF MESA

I, Carolyn Brennenman, certify the above transcript is true and correct to the best of my knowledge.

Carolyn Brennenman
Carolyn Brennenman

Signed before me this 26th
day of April, 1983.

Harry Potter
Harry Potter

My commission expires September 27, 1983.

DEPARTMENT OF INTERIOR

BUREAU OF LAND MANAGEMENT

PUBLIC HEARING

7:30 P.M. -
Thursday, April 7, 1983
Stetson Room
Ranada Inn Prohilla
11592 West Platte Avenue
Lakewood, Colorado

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INDEX

HEARING OFFICER - Larry Porter, Chief of
Planning and Environmental
Assistance, Grand Junction
District Office, Bureau of
Land Management

ALSO PRESENT - Bob Kline, Bureau of Land
Management Team Leader

SPEAKERS

PAGE NO.

Rocky Smith - Colorado Mountain Club 9
Robert Vukobac - Environmental Defense Fund 17

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Statement. The podium at the front is provided for the
benefit of the speakers who are going to give testimony. We
would like you to come up to the front and use the podium so
that the court reporter can clearly hear what you have to say
as well as those of us in the front and others in the room.

The first speaker who has signed up to give
testimony into the public record this evening is Rocky Smith
representing the Colorado Mountain Club. I understand that
Rocky has a slide presentation for us tonight to go with his
testimony.

MR. SMITH: Three slides.

MR. PORTER: And if any of you in the back would
like to get a closer look at the slides he has, feel free to
move up. There are some chairs in front.

Rocky?

Excuse me, one other thing. For those who are giving
testimony, I would appreciate it if you would state your name
and address clearly for the record as you do begin your
comments.

MR. SMITH: My name is Rocky Smith. I live at 1930
Pearl in Denver, and I'm testifying on behalf of the Colorado
Mountain Club, which is a statewide recreation and conservation
organization of over 7500 members with groups in 11 Colorado
cities and towns.

Our club maintains the visitor registers on top of

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any of our high peaks in the Colorado Rockies. We take well
over 5000 hiking, climbing, camping, and skiing trips into the
mountains every year. All trips are open to the public.

We are extremely concerned about the projected air
quality impacts from the proposed Clear Creek project and have
been specific comments on the Draft Environmental Impact
Statement.

1. In the scoping process the Colorado Mountain Club
requested that there be an assessment of cumulative air
quality impacts including: other proposed or existing oil
shale and related operations, the Chevron refiners and upgrading
facilities, the open pit mine, haul roads, general construction
activities, and emissions from construction and operation of
the 300 megawatts of power necessary for the project.

None of this is in the Draft Environmental Impact
Statement; much to tell. For example:

- The draft contains a cumulative analysis only for
the proposed action, the New site;
- There is no cumulative analysis for BLM's preferred
alternative with the upgrading facility near Frutis;
- There is no cumulative analysis for BLM's biologi-
cally preferred alternative of 50,000 barrels per day sited on
the West;
- There is no cumulative analysis for acid deposition
rates for any of the alternatives;

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- And it does not appear that the emissions from the construction and maintenance of the 305 megawatts of power is included in the document.

It is extremely difficult for us and for any public or government organization to compare alternatives without this information. We again request that the final environmental impact statement include a cumulative analysis for each alternative, and that this analysis state in a clear and understandable format projected acid deposition rates, projected visibility impacts, and projected impacts on the RPD increments.

2. In the scoping comments we requested an explanation of the emission inventory scale-up used to predict emissions from a commercial-scale operation. Quoting from the Mountain Club scoping comments of December 15, 1981: "It has been shown repeatedly that predicting air pollution emissions from a large, commercial-scale operation, based on small-scale laboratory operations, involves errors of significant magnitude." This information comes from a personal communication with Dr. Davis Greenland, Professor of Chemistry at the University of Colorado in Boulder.

The original data and the scale-up information is critical to an assessment of the accuracy of the air quality in the document. It is not included in the RPD. Given the known data presently available from the Chevron RPD technology, the

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52

Final environmental impact statement needs to justify how the commercial emissions were predicted. Appendix B-2 describes the model for dispersion of pollutants into the atmosphere but does not describe the Chevron lab tests and how the data were scaled up.

3. A major area which has not been addressed in the DEIR is the air quality impacts of the proposed development and the cumulative air quality impacts on Colorado's recreation and tourist industry. Tourism and recreation is a major, stable, statewide industry. It exists in every town and valley in Colorado. In the face of boom-bust cycles from mining, many small communities such as Leadville, Rifle, Newberry, and the Great Smoky Mountains area are attempting to rebuild based on this stable industry.

In 1982 Colorado estimates there were approximately twelve million tourists who spent more than two billion dollars in the state. Colorado has 101,135 travel-generated jobs and a travel-generated payroll of \$761 million. This generates a state tax receipt of \$104 million and local tax receipts of \$67 million. These figures are from Morgan Smith, Director of the State Department of Local Affairs. These were entered into the Colorado RPD hearing record on March 10, 1983.

Tourism and recreation in Colorado depend on clean air, the absence of haze, no impairment of visibility, and the absence of harmful acid deposition. Unfortunately, these are

52

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precisely the impacts projected from the Chevron and other oil shale operations.

The visibility analysis for the proposed action states on page 4-8 that there will be visibility impacts inside the Flattops Wilderness Area. If visibility impairment occurs inside the area, it most certainly will occur outside the area and, in some instances, could be considerably worse. There could well be continual visibility impairment given the fact that an ongoing oil shale operation will produce emissions 24 hours a day, 7 days a week, 365 days a year.

I would now like to show you three slides of areas that could be impacted.

Our first slide here is a view from the Mountaintop chair lift of the Beaver Creek ski area looking approximately northwest over the Colorado River Valley at the Flattops Wilderness Area. If there is visibility impairment inside the Flattops, it is very likely that this view could be impaired.

This slide is a view from the new chair lift located northeast across the Colorado River Valley to Vail Pass and the Gore Range-Jagles Hut Wilderness Area. Any pollution lower down in the Colorado River Valley will tend to be carried further east up the valley and possibly, even over Vail Pass.

And this slide is looking from the top of Mt. Werner at the Steamboat Springs ski area looking approximately straight

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52

west 35 to 40 miles toward the Flattops. What pollution occurs over the Flattops will certainly affect this view.

We request that these views be included as sensitive receptors, as described on page 3-1 of the DEIR. We request that the final RPD analyze visibility in these areas. We also request that local parks and recreation areas closer to the Clear Forks area, such as the Rifle State Park, be included in sensitive receptors and that the deposition rate analysis and visibility impacts analysis be done for these areas also.

It is essential that these analyses be done. The cumulative analysis for the Mesa Top Alternative, the Proposed Action, indicates a strong possibility that the Class I sulfur dioxide increment will be exceeded in both the Flattops and the Mt. Silver Wilderness areas, that the Class I total suspended particulate increment will likely be exceeded in the Flattops, and that the Category I sulfur dioxide increment may be exceeded in Hinesburg National Monument. In Table 4.14-2, page 4-164, which has this information, the footnotes "b" and "c" have been reversed. This needs to be corrected in the final RPD.

The Steamboat and Beaver Creek ski areas, the Flattops and Mt. Silver Wilderness areas, and local parks are "close-in" regional areas as far as oil shale development is concerned. The long-distance regional areas may also be

52

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1 affected. The polluted air will not stop when it reaches the
2 eastern boundaries of the Flattops or the Frontal. The
3 pollutants will continue to disperse, but they will move over
4 the White River and South National Forests, up the Colorado
5 River Valley, possibly over the Indian Peaks Wilderness Area,
6 over Rocky Mountain National Park, and even on into Wyoming.
7 This will be a continual stream, day and night, summer and
8 winter, 365 days a year.

9 The tourism and recreation industry in Colorado is
10 both a winter and summer industry. Millions of Colorado
11 citizens and out-of-state visitors enjoy the Colorado Rockies
12 all year round. BLM needs to address this issue. We must ask
13 what will happen to this state if Beaver Creek, Vail, and
14 Steamboat Springs, and other areas have the reputation of
15 being hazy and dirty because of oil shale development? What
16 will happen if the Mount and White River National Forests get
17 the reputation of having dead or dying lakes from acid
18 deposition?

19 Based on the potential impacts to tourism and
20 recreation, we request that BLM develop an alternative that
21 requires Chevron to recycle all polluting emissions and to
22 develop less labor-intensive technology. This is not the same
23 as a no-action alternative which requires no further comments
24 on technology.

25 The costs and impacts of a zero emissions-zero impact

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52

1 intensive technology could then be compared with the costs and
2 the impacts that will be placed on the tourism and recreation
3 industry and the citizens of Colorado from the Proposed Action.

4 In summary, we request that the final environmental
5 impact statement include:

6 1. A cumulative analysis of all alternatives and
7 that this analysis include the 300 megawatts of power necessary
8 for the operation;

9 2. A cumulative acid deposition analysis for all
10 alternatives;

11 3. A clear explanation of the original data and the
12 process for the emission inventory scale-up;

13 4. An analysis of the cumulative air quality
14 impacts, both summer and winter, on the tourism and recreation
15 industry;

16 5. The two views from the Beaver Creek ski area,
17 the one view from the Steamboat Springs ski area--that were
18 shown on the slides--and all nearby local and state recreation
19 areas to designated sensitive receptors, and deposition
20 analyses and visibility analyses be done for these areas;

21 6. A more cost-effective and less labor intensive
22 technology as an alternative.

23 Copies of the slides and prints of the slides will
24 be included in the written comments from the Colorado
25 Mountain Club, and I appreciate this opportunity to testify.

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52

1 Thank you.

2 MR. PORTER: Thank you, Jerry.

3 The next speaker scheduled to present testimony into
4 the public record is Ron Yunker, representative of the Environmental
5 Defense Fund.

6 Bob, would you please spell your name for the
7 court reporter, please?

8 MR. YUNKER: [I'll give you my name.

9 I've had a very hard time trying to pronounce
10 of this BLM. It's a very poorly written document. A number
11 of sections are very ambiguous. As some points it states
12 clear that the cumulative analysis was done, and then in other
13 parts of the presentation it's not at all clear whether or not
14 cumulative impacts have been considered.

15 With specific reference to the air quality analysis,
16 there is a statement on page 4-15 that indicates that
17 cumulative analysis was done to calculate deposition rates
18 associated with acid deposition, and it identifies the amount
19 considered in the cumulative analysis.

20 But in the following pages, on page 4-18 and
21 following, it's not at all clear whether or not the analysis,
22 for example, with respect to visibility, has indeed been a
23 cumulative impact analysis.

24 Given these ambiguities, it's been extremely
25 difficult to draft intelligent comments, and I would like to

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52

53

1 use tonight whether or not some of these points can be made
2 clearer on the record, particularly, for example, with respect
3 to the reference to visibility analysis on page 4-18.

4 MR. PORTER: Would you clarify that, please? Are
5 you asking for the Bureau of Land Management to make a
6 representative comment?

7 MR. YUNKER: Well, I'm asking how many sources are
8 included in the analysis, for example, with respect to
9 visibility on page 4-18.

10 MR. PORTER: I'd like to go back to the original
11 document, up I stated the two tourist towns, which is to
12 include comments on the adequacy of the document. If you
13 will think whatever you have to say in terms of a comment,
14 then that will be understandable for the public record.

15 MR. YUNKER: Well, this is really a mockery of the
16 process because it's impossible to prepare intelligent
17 comments when the document itself doesn't tell you what you
18 did, and then you go to say to the public, "Come in and give us
19 your comments," when it's not at all clear how you performed
20 those analyses or what they consist of, makes this whole
21 effort meaningless.

22 MR. PORTER: Well, then, I would suggest you make
23 that as a comment and then go on with the rest of your
24 statement.

25 MR. YUNKER: So the answer to my question, then, is

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53

1 that those clarifications will not be provided.

2 MR. PORTER: Not tonight at this meeting.

3 MR. TURNER: Under what circumstances would they
4 be provided prior to the close of the current period?

5 MR. PORTER: Why don't you see us tonight after the
6 meeting if you do have questions, and we would be happy to go
7 over those and that might help you to frame additional
8 comments which we would receive until May 3.

9 MR. TURNER: Okay. One of the things that's
10 indicated in the EIS is that certain analyses are performed
11 as part of the PSD permit application. Is it your intention
12 that the PSD permit application be considered part of the
13 EIS or not?

14 MR. PORTER: It is a supporting document, so it you
15 would like to comment on that basis, go ahead.

16 MR. TURNER: Okay. There are numerous distribution
17 in the air quality analysis that are apparent from the document
18 in addition to those that might be apparent if there were
19 better explanation. Among those is a lack of any major
20 analysis. There is no presentation of any background data.

21 Recent data collected by various agencies in Canon,
22 Garfield, and Rio Blanco Counties indicate that there may be
23 exceedances of the national ambient standards for ozone in that
24 area, particularly data collected at the Anvil Joint site
25 during 1981 and data collected at the "Red" House in Utah. Great

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53

1 of those data are present here, nor are they analyzed with
2 respect to the extent to which there may be an exceedance of
3 the national ambient standard, nor with respect to what their
4 causes may be, nor with respect to any possibility of obtaining
5 offsets, if necessary, in order to maintain compliance with
6 the national health standard for ozone.

7 In addition, there is no modeling analysis or any
8 other attempt to evaluate the effects of hydrocarbon and NOx
9 emissions from the source which are precursor emissions
10 responsible for ozone formation on the ambient concentrations
11 of ozone in the region.

12 Given the fact that ozone is a pollutant which not
13 only has health effects at the levels of the national ambient
14 standard, but which, according to EPA documentation, as well as
15 testimony recently presented by the Colorado Department of
16 Agriculture at the Colorado legislative hearings on the State
17 Air Act, ozone at the levels near but not at the national
18 ambient standard will also have significant adverse effects on
19 agricultural production.

20 To the extent that the effects on vegetation are
21 included to be considered as a part of the EIS and also as
22 part of the PSD application, these agricultural impacts have
23 not been addressed and need to be in order for the EIS to be
24 adequate.

25 In addition, there is no consideration, whatsoever,

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53

1 of toxic pollutants which would be emitted from this oil
2 shale process for the disposal of spent shale.

3 Toxic pollutants have been identified in 33
4 publications over the last three years as being produced in
5 the oil shale process. These include numerous organic
6 pollutants as well as heavy metals, including lead, arsenic,
7 mercury, selenium, and others.

8 To the extent that these pollutants will be
9 distributed in the environment in the new ground water of
10 these proposed sites, the degree to which these pollutants
11 are likely to be found after a certain number of years of
12 operation in these facilities should be evaluated and the
13 consequences of distributing pollutants at that time in the
14 environment should be addressed with respect to not only the
15 impacts on human health, but also on the impacts on livestock,
16 particularly via the pathway of uptake in the grazing material
17 in the area, and also the insects of the distribution of these
18 organic materials into the aquatic environment.

19 Visibility analysis is one that we cannot make sense
20 out of with respect to what is presented. With respect to
21 that, another area of ambiguity, aside from whether or not
22 there was any kind of cumulative analysis performed with respect
23 to impacts on visibility, is also the uncertainty regarding
24 what level of production is used.

25 On page 4-18, in discussing the Prudhoe Alternative,

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53

1 When in discussion, first, that the analysis is performed for
2 a production rate of 50,000 barrels per day, and then,
3 alternatively, in another statement, it is claimed that the
4 analysis is based upon 75,000 barrels per day for the
5 retorting facility and 60,000 barrels per day for the retorting
6 facility. There needs to be some clarification of what
7 actually has been used for these analyses.

8 Now, another factor that needs to be taken into
9 account in the air quality analysis is malfunctions. The
10 state regulations enacted by the Colorado Air Commission
11 allow for variations in excess of permit levels under what are
12 called "short conditions." State regulations specifically
13 provide that emissions in excess of allowable standards shall
14 not be deemed to be a violation of regulations provided that
15 the violation is notified as soon as possible after the upset
16 condition occurs followed by written notice with an explanation
17 of what steps are being taken to correct the malfunction.

18 These regulations contemplate that a malfunction
19 condition can continue for relatively extended periods of time
20 during which the source is repairing the malfunctioned
21 equipment. In a source that is controlled at the level of
22 95 percent, a complete malfunction of the emissions control
23 system would result in a 20 times increase emissions which
24 can be extremely significant over relatively short periods of
25 time, and the longer the malfunction continues, obviously, the

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53

more significant the impacts become.

Given the fact that these emissions are permitted under State regulations, they must be considered in the EIS. There is precedent for this.

In an EIS that was prepared by the Army Corps of Engineers for a new Greenfield steel mill in Pennsylvania in 1975, the so-called U.S. Steel Conestoga plant, the EIS team asked the source operator whether or not the source intended to make a commitment to shut down any sources where there was a malfunction of control devices, and if that was not the intent, then the malfunction estimate should be provided by the source.

In this case we would ask that the same procedure be followed, that Chevron be asked specifically to make a commitment to either not operate sources when control equipment malfunctioned and emissions, as a result, exceeded allowable limits, or, in the alternative, to provide an assessment of the frequency with which malfunctions are likely to occur based upon similar experience with the same types of controlled equipment in other settings, and to evaluate what the environmental consequences of the emissions resulting from those malfunctions would be.

Now, I'm personally familiar with that situation in Pennsylvania because at the time I was working for the Attorney General's office in Pennsylvania and sat on the EIS

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53

team, so if you need any more information about that, I'd be happy to provide it.

As part of the EIS we believe there needs to be an expanded treatment of technology alternatives. The only technology alternatives that are addressed at all that we can identify are in the PMS permit application. Given the projected effects of cumulative impacts of a number of oil shale sources which were included in the EIS performed by the BLM for the cumulative-to-address the cumulative impacts of the prototype oil shale leasing program, there is an indication that the PMS of the most sensitive lakes and the high altitude areas will be reduced to levels substantially below State water quality standards.

Now, there is a statement in the EIS here to the effect that the maximum decrease in lake PH will be down to about a PH of six. That, however, is below the standards allowed by the State Water Quality Control Commission.

The Water Quality Commission standards for the Flatheads are no change. Existing water quality is set as the standard for both the Flatheads and a number of other Class I areas in Colorado.

The fact that there would be a reduction in PH from the current level which Turk (phonetic) has designated as being approximately 7 in Wilson Lake, which is the lake that he has identified as being the most sensitive, a reduction from

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53

7 to 6 certainly is not consistent with State water quality standards.

Given the fact that there is a significant likelihood of a substantial change in the aquatic environment and that that change appears to be inconsistent with State water quality standards, there needs to be a more careful treatment of the alternatives available for the reduction of acid pollution emissions from this source, particularly because it is now under consideration, but also for all sources that are included in the comprehensive analysis that was part of the prototype leasing EIS.

Specifically, we would urge that there be an analysis that includes consideration of the catalytic technology, the ammonia-based catalytic technology that has been developed and installed on major NOx sources in Japan and which has been used by the State of California as the basis of making state new-source performance standards for major NOx sources.

I am providing you tonight with a copy of the executive summary and the introductory pages, along with the table of contents, of the California technical support document which was developed by the staff in California evaluating the ammonia-based catalytic technology.

Based upon that technology, the State of California has adopted a standard which approximates an 85 to 90 percent reduction in NOx emissions.

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53

It is not clear from the EIS what assumptions are made with respect to the control level to be achieved with respect to NOx emissions, nor is it clear with respect to the PMS that matter, but I assume that the EIS did not make the assumptions based upon the 85 to 90 percent control level now in.

In including the technology in your analysis there should be some consideration of both the environmental benefits, particularly with respect to the total amount of potential acid precipitation to be removed by this source, and also the associated costs which would either justify or not justify the use of that technology.

Dr. WIGG is filing much more extensive written comments by the end of the comment period, and I would appreciate in opportunity to discuss with you some of the highlighted items in the document which will make it possible for us to file some additional comments.

Dr. FURBER: Thank you.

WIGG: Do you have any clarifying questions?

Dr. FURBER: No.

Dr. FURBER: Okay. Thank you.

At this time I'd like to ask if there are any other comments you would like to make oral comments for the record at this meeting.

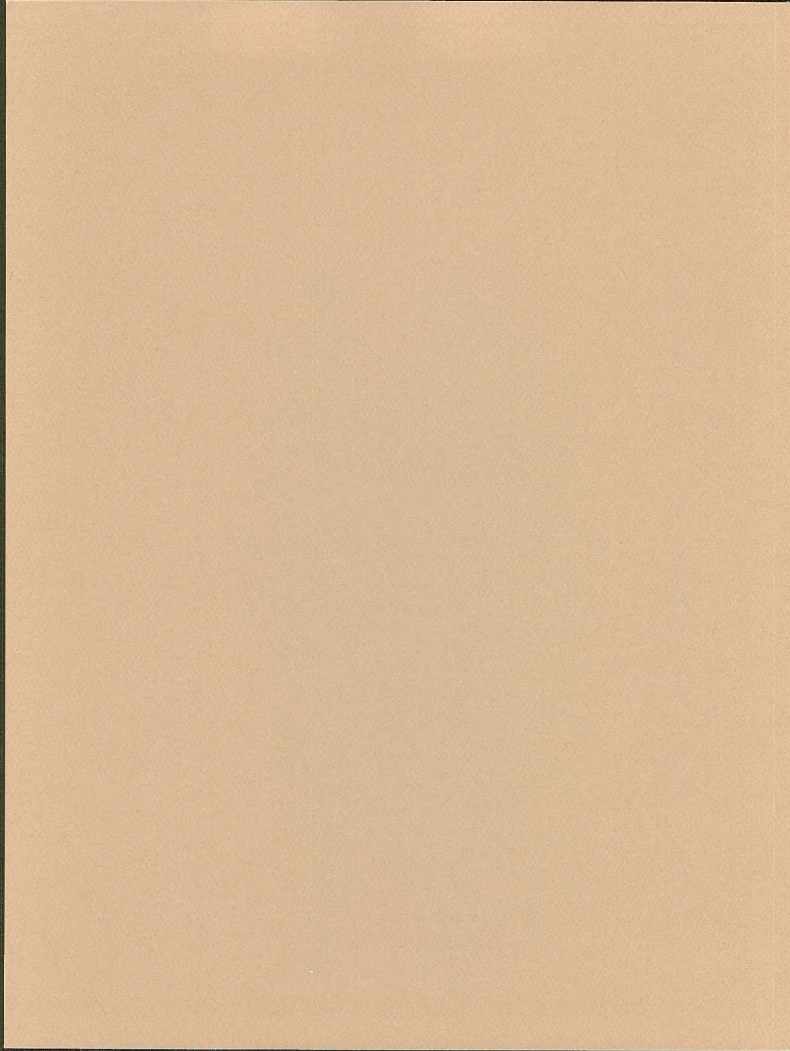
(No response.)

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53

6.0

List of Preparers



6.0 LIST OF PREPARERS

In addition to those persons listed in Section 6.0 as contributors to the CCSOP Draft EIS, the following persons contributed to the Final EIS for the CCSOP.

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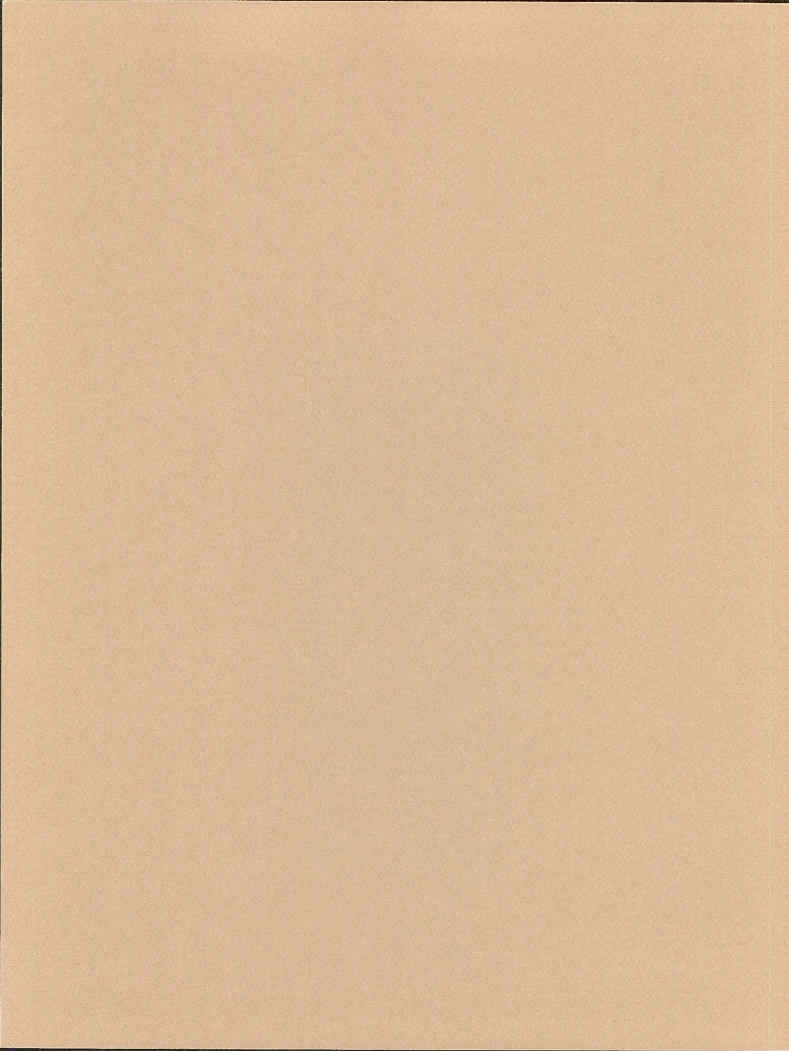
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7.0

Glossary of Terms



7.0 GLOSSARY OF TERMS

These terms are in addition to those terms listed in the Glossary of the DEIS. Please see the DEIS Glossary for a more complete listing.

ACRE-FOOT The amount of water or soil which covers an acre of land to a depth of 1 foot, equivalent to 325,851 gallons.

EROSION The wearing away of the land surface by running water, wind, ice, or other geologic agents including such processes as gravitational creep.

FUGITIVE RELEASES Air emissions from non-point sources such as unpaved roads or construction disturbances.

LEACHATE A solution created by the percolation of water through soil or solid waste containing soluble substances.

PERMEABILITY The capacity of an aquifer to transmit or yield water, expressed in units of length divided by time.

PSD APPLICATION The air quality permit application for a "Prevention of Significant Deterioration" review by the administering agency.

RUNOFF The portion of the precipitation on land (particularly rain or snow) that flows over the ground surface and ultimately reaches streams.

SEDIMENTATION The action or process of forming or depositing sediment, particularly in water bodies.

TOTAL DISSOLVED SOLIDS Those solids (mostly salts) capable of passing through a glass fiber filter (Reeve Angel type 934-AH or equivalent) when dried to a constant weight at 180°C.

TOTAL SUSPENDED SOLIDS Those solids (sand, silt, etc.) which are retained by a glass fiber filter (Reeve Angel type 934-AH or equivalent) when dried to a constant weight at 105°C.

UNGULATE SPECIES Those species belonging to the group consisting of hoofed mammals, most of which are herbivores and many of which are horned.

OF GREAT BRITAIN AND IRELAND

Volume 100, Part 1, 1970

Edited by

Professor Sir John H. Huxley

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8.0

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8.0 REFERENCES

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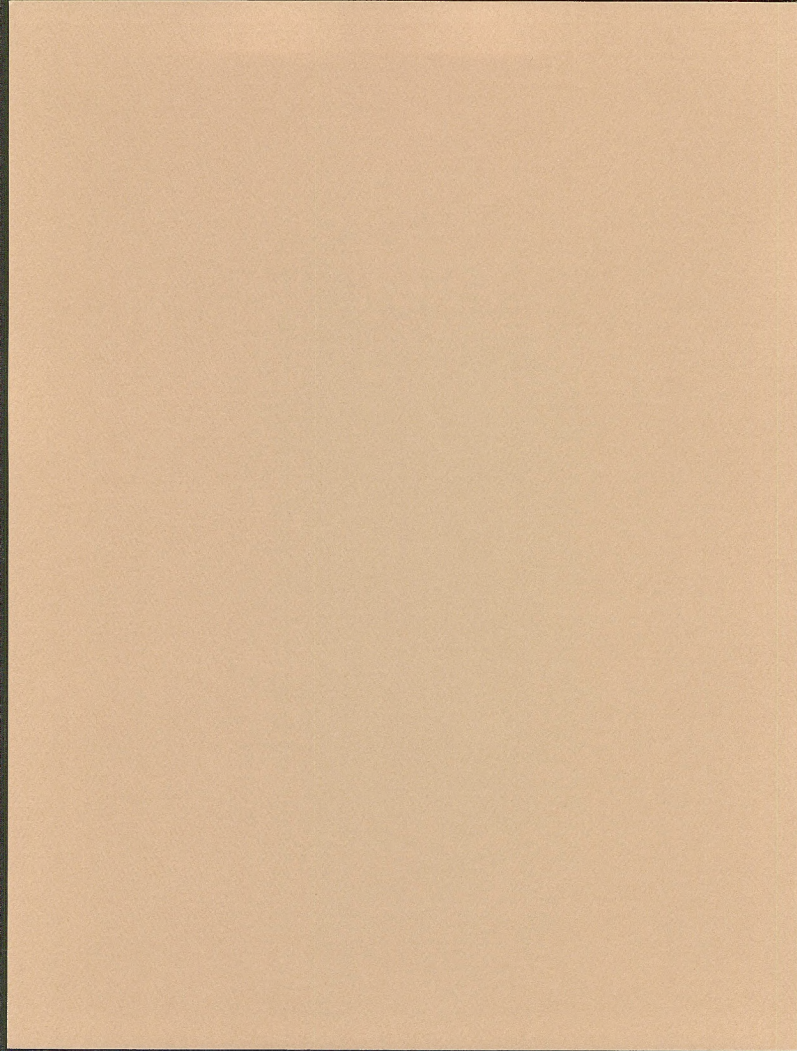
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Appendices



APPENDICES

B Impact Analysis Methods and Assumptions

B-2 Air Quality Modeling and Assumptions

C Mitigation

C-1 Summary Tables of Potential Environmental Impacts and Recommended Mitigation

C-2 Detailed Social and Economic Mitigation Measures



APPENDIX B-2

AIR QUALITY MODELING AND ASSUMPTIONS

APPENDIX B-2
AIR QUALITY MODELING AND ASSUMPTIONS

The air quality analyses performed in the CCSOP EIS are to determine predicted impacts from the proposed facilities and their alternatives. Air quality simulation modeling has been used as the primary analytical tool to determine predicted concentrations. These concentrations were then evaluated as to their impact on public health and welfare. The most definitive consideration of impacts from ambient pollution concentrations to date are EPA air quality standards. These include a primary and secondary standard for a number of pollutants. The National Primary Ambient Air Quality Standards (NAAQS) shall be "standards the attainment and maintenance of which in the judgement of the administrator, based on such criteria in allowing an adequate margin of safety, a requisite to protect the public health." Section 109 (b)(1). Additionally, the National Secondary Ambient Air Quality Standards "shall provide a level of air quality, the attainment and maintenance of which in the judgement of the administrator, based on such criteria, is requisite to protect the public welfare for many known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air." Section 109 (b)(2). Table B-2-1 is a list of primary and secondary National Ambient Air Quality Standards. These standards are designed to provide protection with an adequate margin of safety for public health and welfare. Therefore, comparisons are made throughout the EIS, to these individual standards which are used as a guide determining impacts.

In addition to the primary and secondary standards, the EPA has promulgated a program to prevent significant deterioration (PSD) of existing air quality through the use of increments. These increments establish the maximum increase in pollutant concentration allowed above some assumed baseline level. The only pollutants Congress specifically regulated with the incremental approach were sulfur dioxide and particulate matter. However, the act requires the EPA to determine whether there is a need to develop a similar approach for other pollutants. Violation of an increment would impose a restriction to growth for the affected area. It does not necessarily indicate an adverse health impact. As indicated above,

Table B-2-1 NATIONAL AMBIENT AIR QUALITY STANDARDS

Averaging Period	Primary Standard		Secondary Standard		PSD Increment	
	($\mu\text{g}/\text{m}^3$)	(ppm)	($\mu\text{g}/\text{m}^3$)	(ppm)	Class I	Class II
Sulfur dioxide						
Annual arithmetic	80	0.03	None	None	2	20
24-Hour ^a	365	0.14	None	None	5	91
3-Hour ^a	None	None	1,300	0.5	25	512
Particulate matter						
Annual geometric	75	--	60 ^b	--	5	19
24-Hour	260	--	150	--	10	37
Carbon monoxide						
8-Hour ^a	10,000	9	10,000	9		
1-Hour ^a	40,000	35 ^c	40,000	35		
Ozone						
1-Hour ^d	235	0.12	235	0.12		
Nitrogen dioxide						
Annual arithmetic	100	0.05	100	0.05		
Lead						
Calendar quarter	1.5	--	1.5	--		
Hydrocarbons						
3-Hour (6-9 a.m.)	160	0.24 ^e	160	0.24		

^a Not to be exceeded more than once₃ per year.

^b The secondary standard of 60 $\mu\text{g}/\text{m}^3$ is a guide to be used in assessing implementation plans to achieve 24-hour standard.

^c Revision to 28,630 $\mu\text{g}/\text{m}^3$ and 25 ppm proposed 8/18/80.

^d Standard attained when the expected number of days per calendar year with maximum hourly average concentrations above 235 $\mu\text{g}/\text{m}^3$ and 0.12 ppm is equal to one or less.

^e Hydrocarbon 3-hour standard used only as a guide to develop plans for achieving ozone standard.

increments to date have only been promulgated for sulfur dioxide and particulate matter. The increments for these two pollutants are also contained in Table B-2-1.

COMPLEX I, which was used to predict impacts from the upgrading and retorting facilities, is a steady state, multiple-source, Gaussian dispersion model. It was designed for use with stack emission sources in complex terrain, where terrain elevation exceeds source stack heights and duplicates the basic algorithm of the VALLEY (EPA 1977a) model. The model uses sequential hourly meteorological data (wind speed, wind direction, temperature, stability class and mixing height), and centers the 22.5 degree sector averaged plume on the hourly wind directions. The values of wind speed are adjusted to stack height by standard wind shear profile equations and exponents. For this study, the wind profile exponents given in the Regional Workshop on Air Quality Modeling (EPA 1981) were employed. During nonstable conditions, the plume is assumed to be reflected at the mixing height; therefore, if the effective plume height is above the mixing height, the entire plume is assumed to be trapped above the mixing height with no ground-level impact. Mixing height is not considered during stable dispersion conditions.

COMPLEX I options which were utilized in this study include buoyancy-induced dispersion, gradual plume rise, and half-height plume path coefficient for nonstable conditions. The buoyancy-induced dispersion option accounts for buoyant growth of a plume caused by entrainment of ambient air according to the methods of Pasquill (1976). Gradual plume rise accounts for downwind transport of the plume during the rising phase according to the procedures outlined by Briggs (1972) and was employed in this modeling study because several receptors along the eastern property boundary are located within 1 kilometer of some emission sources. This distance may be less than the distance to final rise during some atmospheric conditions. The half-height correction for unstable conditions is based on the analysis by Egan (1975) of a plume embedded in a potential flow approaching a hemispherical terrain object, which indicates that a half-height correction to the Gaussian formula will provide an estimate of the peak ground-level concentration expected.

With the COMPLEX I model, maximum concentrations are generally predicted during stable plume impingement at the nearest distance downwind where the elevation of the rising terrain equals the effective stack height of the plume. Therefore, to select receptors associated with maximum impact in high terrain, the effective stack height for each of the source types was calculated using the PTPLU model (EPA 1980b). The PTPLU model calculates plume rise using the standard Briggs (1969, 1971, 1975) equation.

The ISCST model which was used to predict impacts from the mining facility, is a steady state, multiple source Gaussian dispersion model. The generalized Briggs (1971, 1975) plume-rise equations, including the momentum terms, are used to calculate plume rise as a function of downwind distance. A wind profile exponent law is used to adjust the observed mean wind speed from the measured height.

The particle deposition algorithm in the ISC model requires specification of deposition velocities and reflection coefficients for each particle size class. Five particle size classes were used in modeling the CCSOP fugitive dust sources. Table B-2-2 presents the mass fraction, gravitational settling velocity, deposition velocity and reflection coefficient for each particle size class.

The mass distribution for the five specified size categories is based on an average of particle size measurements made by PEDCo/MRI (1981) at surface coal mining operations in the western United States. The gravitational settling velocities were calculated from the Stokes equation using an assumed particle density of 2 g/cm^3 . Selection of deposition velocities and reflection coefficients is described in detail in Appendix 4 of the mining and retorting PSD application (Chevron 1982d).

Ozone impacts were predicted using the EPA's (1980c) Empirical Modeling Approach (EKMA) and a variation of this model. The standard version of EKMA incorporates a photochemical mechanism designed for urban areas in which transportation sources dominate the emission inventory. This is clearly not the case for the Grand Valley upgrading facility. For the purpose of this

Table B-2-2 PARTICLE SIZE DISTRIBUTION AND DEPOSITION PARAMETERS

Particle Size Class	Range of Particle Size (um)	Mass Distribution % ^a	Characteristic Particle Diameter (um)	Gravitational Settling Velocity ^b (m/sec)	Deposition Velocity (m/sec) ^c	Reflection Coefficient
1	0-2.5	3	1.6	0.0001	0.002	0.82
2	2.5-5	4	3.9	0.0009	0.006	0.71
3	5-10	9	7.8	0.0036	0.01	0.50
4	10-15	5	12.7	0.0095	0.019	0.26
5	>15	79	22.2	0.0294	0.029	0.03

^a PEDCo/MRI (1981). Mass distribution shown for fugitive sources. The mass distribution for sources controlled by a baghouse were linearly adjusted assuming no particles >15 microns.

^b Based on Stokes law for particles of spherical shape with diameter equal to the characteristic particle diameter for each size class. The density of the particles was assumed to be 2 g/cm³.

^c From Sehmel and Hodgson (1980).

study, a chemical mechanism, based on the latest kinetic and mechanistic data for selected hydrocarbon photo-oxidations (Atkinson et al. 1982), and capable of incorporating hydrocarbon species more appropriate for the types of emissions expected to occur from operation of the upgrade facility, was substituted into the EKMA framework (ERT/EKMA). A full discussion of this modification is presented in Appendix C of the upgrading facility PSD application (Chevron 1982f). Ozone impacts were also examined with the standard EPA/EKMA model. The results are based on three transport scenarios and three specific historical-meteorological conditions, and indicate that emissions from shale oil upgrade facilities will have minimal impact on ambient maximum ozone concentrations.

Air quality impacts from the secondary, growth related emissions were calculated using box modeling techniques.

The basic equation is:

$$X = Q/UA$$

where: X = ground-level pollutant concentration ($\mu\text{g}/\text{m}^3$)

Q = pollutant emission rate ($\mu\text{g}/\text{sec}$)

U = ventilation wind speed (m/sec)

A = cross-sectional area normal to the ventilating wind defined by the narrowest city side and the mixing height

This equation yields maximum concentrations during stable nighttime dispersion when wind speed and mixing height are at a minimum. Mean wintertime (worst-case) values for these parameters measured at Grand Junction are 3.1 meter/second wind speed and 176 meter mixing depth (Holzworth 1972). The length of the shortest city side is about 5 kilometers for Grand Junction and 1.25 kilometer for Fruita. The 1-hour concentration estimates predicted were converted to longer averaging times by assuming 3 hours of persistence for 3-hour averages, and 6 hours of persistence for 8-hour and 24-hour averages.

Impacts of Particulate Matter

Particulate matter may include a wide range of particle sizes, forms, and chemical compositions. Each of these factors affects the potential environmental impact of the particulates which are emitted. Particulates which are deposited on plant surfaces can remain as a dry dust, can be removed by wind or rain, or can form a hard incrustation. The primary effects of particulates on vegetation include: (1) inhibiting gas exchange, (2) increasing leaf temperature, and (3) reducing photosynthesis. Particulate deposits may be directly toxic to vegetation if they contain toxic elements which can be hydrated and taken up through leaf surfaces.

The soil forms the major sink for particulate matter. Again, the chemical and physical characteristics of the particulates determine the nature of the impacts produced in the soil environment. Litter decomposition, mineralization, and nutrient cycling may all potentially be affected by particulate deposition. The deposition of soluble toxic elements can be harmful to plants if they are taken up through the roots.

Particulate matter is generally not considered to be a pollutant which produces significant environmental impacts on soils and vegetation. Literature addressing the impacts of particulates on vegetation are quite limited. Generalized impact assessments for particulates are difficult to conduct since the chemical composition, deposition rate, and solubility of potentially toxic elements must be known in order to evaluate the potential impact of these emissions.

Impacts of Oxides of Nitrogen

The primary NO_x constituents are nitric oxide (NO) and nitrogen dioxide (NO_2). Plant injury is thought to be primarily a function of exposure to NO_2 . The combustion of fossil fuels and industrial processes are two important anthropogenic sources of NO_x .

The potential for NO_2 impacts on vegetation is a function of the pollutant dose, environmental conditions of exposure, plant species exposed, and the

genetic and physiologic characteristics of the exposed plants (Middleton et al. 1958). The air quality impact analysis shows regional compliance with NO_2 NAAQS of 100 ug/m^3 (annual average). This standard is considered adequate to protect vegetation from injury.

Evidence of plant response to toxic levels of NO_x can be divided into three major categories: (1) acute injury, (2) chronic injury, and (3) physiological effects. Acute injury is manifested by collapse of cells with subsequent development of identifiable necrotic patterns. Symptoms usually result from short exposures (hours) to varying levels of NO_2 and appear within 2 to 48 hours after exposure.

Chronic injury is caused by intermittent exposure, over longer periods, to low concentrations of gas. It results in chlorotic or other pigmented patterns in leaf tissue and may be accompanied by loss of leaves (leaf-drop) (HEW 1971). Physiological effects frequently associated with pollutant exposure cause growth alterations, reduced yields, and changes in quality of plant products.

Symptoms of NO_2 injury appear as irregular white or brown collapsed lesions on tissue between the veins and near the leaf margin (Southwest Energy 1972).

Impact of SO_2 on Vegetation in the Grand Valley

The vegetation in the Grand Valley region can be divided into six major habitat types: river woodland, phreatophytic shrub, marsh, agricultural, desert, and pinyon-juniper (ECI 1976). The river woodland habitat is prevalent along the Colorado River drainage. Phreatophytic shrub habitats occur along wastewater drainages and on a great variety of agricultural waste areas with high water tables. Marsh habitat develops near seeps along irrigational canals and in lowland areas which are regularly inundated by surface water. Agricultural habitat exists on cultivated lands which rely on irrigation water. Desert shrub habitat and pinyon-juniper habitat occur on nonirrigated lands in the region. Pinyon-juniper habitat is of limited extent and is primarily located along the southwestern edge of Grand Valley.

Excessive dosage of SO_2 can adversely impact vegetation by producing foliar injury and inducing accelerated leaf senescence. In addition, biomass production is believed to be influenced by SO_2 exposure. Long-term exposure to SO_2 may also lead to reduced vegetation growth and yield.

Impact of SO_2 on Vegetation at Arches National Park

The dominant vegetation habitats at Arches National Park are pinyon-juniper, blackbrush, cottonwood parmarisk, sagebrush, and shadscale (Chevron 1982f). Pinyon-juniper and blackbrush are found in abundance throughout the park. Cottonwood parmarisk occurs in dry washes and along riverbanks where water is available. Sagebrush is highly localized and can only be found in limited areas of the park. Shadscale occurs in areas where soil conditions are poor.

APPENDIX C-1

SUMMARY TABLES OF POTENTIAL ENVIRONMENTAL IMPACTS
AND RECOMMENDED MITIGATION

Table C-1-1 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
UNDERGROUND MINE - CLEAR CREEK MESA

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Ground water contamination from underground mine activities	*Containment of high TDS surface water at Spillway 1 (West Willow Creek) and Spillway 2 (Clear Creek) for settlement, before releasing into mined-out portion of the underground mine *Proper routing and/or confinement of surface waters diverted underground to prevent infiltration to and degradation of ground water (or surface water) *Control of oil and grease spills and proper storage of such chemicals to prevent ground water degradation *Diversion and treatment of mine inflows before release into ground water Minimize ground water exposure to blasted rock exposed to ammonium nitrate Monitor underground by-pass water quality Compliance control program for mine inflows and surface flows diverted through the mine
	<u>Wildlife</u>	
	Displacement of wildlife resulting from increased human access to and activity in sensitive areas	*Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time. *Equip machinery to suppress noise *Avoid wetland areas through siting alternatives *Avoid construction of project facilities on or near key wildlife use areas (nesting, fawning, calving areas) *Restrict ORV use on Operator controlled property. *Fencing should be minimized and should not exclude wildlife except from hazardous areas including consideration for grazing and personnel safety. Fences should be designed in consultation with CDOW and USFWS.

^a * Operator-committed mitigation.

Table C-1-1 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
UNDERGROUND MINE - CLEAR CREEK MESA (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	*Enforce 30-mph speed limits at key big game crossing areas (as identified through monitoring studies) *Employ appropriate means to minimize big game road or rail casualties, if kill frequency exceeds 10/mi/yr (may include fencing and construction of big game passage ways) *No activity should occur within an appropriate buffer zone around any occupied or active raptor nest except as provided by USFWS and CDOW *No public access to critical wildlife habitats under Operator control without consultation with CDOW and USFWS
	Wildlife mortality resulting illegal harvest	*Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site *Promote wildlife protection education program as part of employee orientation
RECLAMATION (POSTOPERATIONAL)	<u>Wildlife</u>	
	Residual decrease in wildlife habitat quantity and quality	*Restore premining level of interspersions of shrubs, grassland, and forest cover where possible in consultation with BLM, USFWS, and CDOW *Restore forest cover in all topographic situations suitable for tree plantings where possible in consultation with BLM, USFWS, and CDOW *Establish brush piles throughout reclaimed areas to increase availability of cover for small animals *Reseed roadway shoulders and borrow ditches with unpalatable vegetation *Revegetate all disturbed lands where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife

^a * Operator-committed mitigation.

Table C-1-1 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
UNDERGROUND MINE - CLEAR CREEK MESA (concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
RECLAMATION (POSTOPERATIONAL) (cont.)	<u>Wildlife (cont.)</u>	*Reclamation for wildlife would be a priority in the final decommissioning of the CCSOP
	<u>Vegetation</u>	
	Loss of candidate threatened or endangered plant habitat	Maintain surface water flows and quality at Clear Creek Falls area
		Avoid or minimize disturbance to talus slopes and cliffs in developing access roadway
	<u>Surface and Ground Water</u>	
	Ground and/or surface water quality	Monitor water quality (TOC, NO ₃) of water passing through the abandoned excavations before releasing into Clear Creek

^a * Operator-committed mitigation.

Table C-1-2 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
SURFACE MINE - CLEAR CREEK MESA

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Surface and ground water contamination	*Safe routing of all surface flow from spring discharge around all disturbed areas *Proper control of oil, grease, and diesel fuel, and spills *Use poor quality runoff collected in the pit as spent shale moisturizing water Prevention of underdrain clogging *Proper routing or containment of underdrain discharge if it has poorer quality than receiving waters Replacement of wells or water lost to affected users *Design diversion channels constructed for Mud Springs, No Name Creek, and East Willow Creek to handle a 25-yr flow Compliance control program
	<u>Wildlife</u>	
	Avifauna (bird) mortality resulting from electrocution or project-related activities	Avoid riparian and wetland areas through siting *Avoid where possible key raptor foraging, roosting and nesting areas through siting *No activity should occur within an appropriate buffer zone around any occupied or active raptor nest except as provided by USFWS and CDOW **"Take" or "transplanting" of protected (according to regulations) raptor nests shall occur according to specifically permitted actions by USFWS and CDOW
	Wildlife mortality resulting from collisions with vehicles	*Enforce 30-mph speed limits at key big game crossing areas (as identified through monitoring studies)

^a * Operator-committed mitigation

Table C-1-2 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
SURFACE MINE - CLEAR CREEK MESA (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (Cont.)	Wildlife (Cont.)	Avoid where possible key wildlife use areas through siting
		*Reseed roadway shoulders and borrow ditches with unpalatable vegetation
		*Employ appropriate means to minimize big game road or rail casualties, if kill frequency exceeds 10/mi/yr (may include fencing and construction of big game passage ways)
		*Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time
	Wildlife mortality resulting from illegal harvest	*Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site
		*Promote wildlife protection education program as part of employee orientation
	Decrease in wildlife habitat quantity and quality	*Restore premining level of interspersions of shrubs, grassland and forest cover where possible and in consultation with BLM, USFWS, and CDOW
		Avoid wetland areas through siting alternatives
		*Restore or create forest cover in all topographic situations suitable for tree plantings where possible and in consultation with BLM, USFWS, and CDOW
		*Fencing should be minimized and should not exclude wildlife except from hazardous areas including consideration for grazing and personnel safety. Fences should be designed in consultation with CDOW and USFWS.
		*Sand and gravel extraction associated with Operator's project should be coordinated through CDOW through MLRB permitting and USFWS through ACOE permitting

^a * Operator-committed mitigation.

Table C-1-2 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
SURFACE MINE - CLEAR CREEK MESA (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	*In consultation with CDOW and USFWS, develop in-house wildlife monitoring program to include such studies as habitat condition and trend, big game population distribution and movements, nesting raptor distribution and status, where needed and appropriate, recognizing funding limitations. *Avoid all Category I habitats through construction siting, where possible *Acres of Category 2 habitats/ranges may be destroyed by development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no net loss of in-kind wildlife/habitat value is realized. Although no commitment to required mitigation acreages is presented here, Operator recognizes that, based on available information, some acres may need to be acquired and enhanced or enhanced to offset project impacts. New enhancement technologies in effect at the time of project development may change the amount of required mitigation acres. *Acres of Category 3 habitats/ranges may be destroyed through development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no loss of relative habitat value occurs. In-kind loss of habitats are to be minimized. No required mitigation acreages are presented; however, Operator recognizes that acquired and enhanced, or enhanced lands may be needed to offset project impacts and may differ from the amount of actual impacted acreage. *Revegetate all disturbed lands, where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife *Operator would contribute to consultation, organization, and development of regional wildlife management plan as appropriate in a cooperatively fund venture with USFWS and CDOW

^a * Operator-committed mitigation.

Table C-1-2 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
SURFACE MINE - CLEAR CREEK MESA (concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	
	Prolonged displacement of wildlife resulting from increased human access to and activity in sensitive areas	*Avoid blasting during nesting, fawning, calving, breeding and nesting seasons *No public access to critical wildlife habitats under Operator control without consultation with CDOW and USFWS *Equip machinery to suppress noise
	<u>Land Use</u>	
	Loss of rangeland for domestic livestock grazing	Compensation
RECLAMATION (POSTOPERATIONAL)	<u>Wildlife</u>	
	Net reduction of big game carrying capacity after reclamation	*Off-site habitat enhancement (fertilization) *Reclamation for wildlife would be a priority in the final decommissioning of the CCSOP *Control grazing pressure on allotments into which big game dispersal occurs Modify game harvest if necessary
	<u>Vegetation</u>	
	Loss of threatened and endangered plant populations and habitat	Minimize disturbance of talus slopes and cliff areas Maintain surface water flows in cliff areas supporting rare plants
	Loss of self-sustaining vegetation	*Re-establish mixtures of native plants suited to various topographic sites where possible and in consultation with BLM, USFWS, CDOW

^a * Operator-committed mitigation.

Table C-1-3 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FEED PREPARATION, RETORT, AND UPGRADING
CLEAR CREEK MESA AND GRAND VALLEY PLANT SITES

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Surface water drainage contamination	*Proper drainage of areas not used for processing facilities to prevent contamination of precipitation and runoff; especially from, near, or around the spent shale piles *Proper containment of spills and leaks *Contingency plans for handling accidental spills
	<u>Wildlife</u>	
	Decrease in wildlife habitat quantity and quality	Avoid removal of vegetation in riparian/wetland areas through use of siting alternatives Restore forest cover in all topographic situations suitable for tree plantings *Fencing of surge basins and drainage ponds Avoid wetland and riparian areas through siting alternatives *In consultation with CDDW and USFWS, develop in-house wildlife monitoring program to include such studies as habitat condition and trend, big game population distribution and movements, nesting raptor distribution and status, where needed and appropriate recognizing funding limitations. *No public access to critical wildlife habitats under Operator control without consultation with CDDW and USFWS

^a * Operator-committed mitigation

C-1-9

^a * Operator-committed mitigation

Table C-1-3 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FEED PREPARATION, RETORT, AND UPGRADING
CLEAR CREEK MESA AND GRAND VALLEY PLANT SITES (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATIONS (cont.)	<u>Wildlife (cont.)</u>	
	Wildlife mortality resulting from collisions with vehicles	*Enforce 30-mph speed limits at key big game crossing areas (as identified through monitoring studies) *Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time *Reseed roadway shoulders and borrow ditches with unpalatable vegetation *Fencing should be minimized and should not exclude wildlife except from hazardous areas including consideration for grazing and personnel safety. Fences should be designed in consultation with CDOW and USFWS. *Employ appropriate means to minimize big game road or rail casualties, if kill frequency exceeds 10/mi/yr (may include fencing and construction of big game passage ways)
	Net reduction of big game carrying capacity after reclamation	*Operator would contribute to consultation, organizing, and developing regional wildlife management plan as appropriate in a cooperatively fund venture with USFWS and CDOW *Off-site habitat enhancement (fertilization) *Control grazing pressure on Operator-controlled allotments into which big game dispersal occurs Modify harvest if necessary
	Wildlife mortality resulting from illegal harvest	*Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site *Promote wildlife protection education program as part of employee orientation

^a * Operator-committed mitigation

Table C-1-3 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FEED PREPARATION, RETORT, AND UPGRADING
CLEAR CREEK MESA AND GRAND VALLEY PLANT SITES (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Soils</u>	
	Loss of prime farmland or irrigated cropland	Compensation or siting
	Reduce erosion; stabilize slopes	*Revegetate immediately
	Erosion	*Revegetate "initial disturbance only" areas
	<u>Miscellaneous</u>	
	Spills	*Spill prevention program for (1) API surge basin and (2) plant area drainage pond
RECLAMATION (POSTOPERATIONAL)	<u>Wildlife</u>	
	Decrease in wildlife habitat quantity and quality	*Restore premining level of interspersions of shrub, grassland, and forest cover where possible and in consultation with BLM, USFWS, and CDOW
		*Reseed roadside areas with unpalatable herbaceous species to lessen attraction of big game to reseeded areas
		*Restore vegetational diversity using native species of high value as food and cover for wildlife where possible and in consultation with BLM, USFWS, and CDOW
		*Restore forest cover in all areas suitable for tree plantings where possible and in consultation with BLM, USFWS, and CDOW
		*Revegetate all disturbed lands, where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife
		*Reclamation for wildlife would be a priority in the final decommissioning of the CCSOP.

^a * Operator-committed mitigation

Table C-1-3 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FEED PREPARATION, RETORT, AND UPGRADING
CLEAR CREEK MESA AND GRAND VALLEY PLANT SITES (concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
RECLAMATION (POSTOPERATIONAL) (cont.)	<u>Vegetation</u> Loss of self-sustaining vegetation	 In revegetation, utilize mixtures of native plants which correspond with original vegetation and land use objectives of BLM in consultation with USFWS and CDOW

^a * Operator-committed mitigation.

Table C-1-4 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FOR ACCESS ROADS, RAILROADS, AND POWER TRANSMISSION LINES
FRUITA, ROAN CREEK, CARR CREEK, AND BRUSH CREEK CORRIDORS

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Water Quality	*Proper erosion and sedimentation control plan *Vegetative buffer zones between roads and streams; keep all roads in CC SOP control clean of all garbage and foreign debris with disposal of such in an acceptable manner
	<u>Wildlife</u>	
	Decrease in wildlife habitat quantity and quality	Use brush blades to minimize disturbance to herbaceous understory and low brush in power transmission line areas Avoid removal of vegetation in riparian/wetland areas through use of siting alternatives Establish brush piles throughout reclaimed areas to increase availability of cover for small animals Avoid river, reservoir, and wetland areas through siting *In consultation with CDOW and USFWS, develop in-house wildlife monitoring program to include such studies as habitat condition and trend, big game population distribution and movements, nesting raptor distribution and status, where needed and appropriate recognizing funding limitations. *Avoid all Category 1 habitats through construction siting, where possible

^a * Operator-committed mitigation.

Table C-1-4 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FOR ACCESS ROADS, RAILROADS, AND POWER TRANSMISSION LINES
FRUITA, ROAN CREEK, CARR CREEK, AND BRUSH CREEK CORRIDORS
(continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	Wildlife (cont.)	*Acres of Category 2 habitats/ranges may be destroyed through development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no loss of relative habitat value occurs. In-kind loss of habitats are to be minimized. No required mitigation acreages are presented; however, Operator recognizes that acquired and enhanced, or enhanced lands may be needed to offset project impacts and may differ from the amount of actual impacted acreage. *Acres of Category 3 habitats/ranges may be destroyed through development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no loss of relative habitat value occurs. In-kind loss of habitats are to be minimized. No required mitigation acreages are presented; however, Operator recognizes that acquired and enhanced, or enhanced lands may be needed to offset project impacts and may differ from the amount of actual impacted acreage. *Fencing should be minimized and should not exclude wildlife except from hazardous areas including consideration for grazing and personnel safety. Fences should be designed in consultation with CDOW and USFWS. *Powerlines should be constructed to prevent electrocutions of migratory birds *No activity should occur within an appropriate buffer zone around any occupied or active raptor nest except as provided by USFWS and CDOW
	Avifauna mortality resulting from electrocution and project-related activities	

^a * Operator-committed mitigation.

Table C-1-4 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FOR ACCESS ROADS, RAILROADS, AND POWER TRANSMISSION LINES
FRUITA, ROAN CREEK, CARR CREEK, AND BUSH CREEK CORRIDORS
(continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (Cont.)	<u>Wildlife</u> (Cont.)	*Appropriate baseline inventories would be conducted over two field seasons to update nesting locations and relative abundance of raptors in vicinity of Fruita - Clear Creek Mesa corridors prior to any construction. Survey procedures would be developed in consultation with CDOW and USFWS. **"Take" or "transplanting" of protected (according to regulations) raptor nests shall occur according to specifically permitted action by USFWS and CDOW
	Wildlife mortality resulting from collisions with vehicles	*Enforce 30-mph speed limits at key big game crossing areas (as identified through monitoring studies) *Employ appropriate means to minimize big game road or rail casualties, if kill frequency exceeds 10/mi/yr (may include fencing and construction of big game passage ways) *Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time *Reseed roadway shoulders and borrow ditches with unpalatable vegetation
	Displacement of wildlife resulting from increased access to and human activity in sensitive habitats	*Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time *No public access to critical wildlife habitats under Operator control without consultation with CDOW and USFWS *Avoid construction where possible on or near key wildlife use areas (nesting, fawning, calving areas)

^a * Operator-committed mitigation.

Table C-1-4 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FOR ACCESS ROADS, RAILROADS, AND POWER TRANSMISSION LINES
FRUITA, ROAN CREEK, CARR CREEK, AND BUSH CREEK CORRIDORS
(continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	
		*Restrict ORV use on Operator controlled land
		*Timing of construction and blasting where possible to avoid breeding/nesting seasons
		*Equip machinery to suppress noise
	Decrease in wildlife habitat quality and quantity	Where preservation is impossible, reestablish permanent ponds and marshes
		*Revegetate all disturbed lands, where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife
		*Reclamation for wildlife would be a priority to the final decommissioning of the CCSOP
	Wildlife mortality via illegal harvest	*Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site
		*Promote wildlife protection education program as a part of employee orientation
	<u>Miscellaneous</u>	
	Potential landslides, slumping or other mass wasting processes	*Avoid areas susceptible to such activity
	<u>Soils</u>	
	Toxic overburden, subsoil or soils	Bury in the core of roadfill slopes
	<u>Vegetation</u>	
	Removal of vegetation with low vegetation potential	Avoid through siting, where possible, Douglas fir and riparian vegetation

^a * Operator-committed mitigation.

Table C-1-4 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
FOR ACCESS ROADS, RAILROADS, AND POWER TRANSMISSION LINES
FRUITA, ROAN CREEK, CARR CREEK, AND BUSH CREEK CORRIDORS
(concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Vegetation (cont.)</u>	
	Impacts to vegetation resource values	Consolidate project activities within corridors to minimize surface disturbance Avoid through siting, where possible, disturbance of relatively productive irrigated agricultural lands Enhance off-site productivity through management practices
	Loss of threatened and endangered plant populations and habitat	*Search for rare plant populations prior to development of final alignments and avoid rare plant habitats, where possible Transplant specimens of threatened cacti (that cannot otherwise be avoided) to suitable protected habitats Compensate for the loss of rare plant habitat by securing other threatened habitat for permanent protection and by controlling access to populations which may be subject to illegal commercial exploitation
	<u>Aquatic Ecology</u>	
	Loss of Colorado River cutthroat trout on Carr Creek due to construction of Straight-line Tunnel route	Study Carr Creek before construction to determine distribution of rare cutthroat trout population

^a * Operator-committed mitigation

Table C-1-5 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
ROAN CREEK AND BIG SALT WASH (GARVEY GULCH) RESERVOIRS

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Surface water contamination	*Proper construction techniques to prevent introduction of high TDS/TSS water in the reservoir or Roan Creek *Control of oil, grease, and diesel spills Proper control during construction to ensure minimal aquifer disruption or damage *Monitor water quality and quantity changes downstream of dams
	Quick release of stormwater resulting from a heavy rainfall and/or snowmelt	Water level control structures
	<u>Wildlife</u>	
	Pressure on game fish populations	Control recreational fishing by the general public, miners, and their families; consider use of project reservoirs as sport fisheries
	Decrease in wildlife habitat quantity and quality	*Revegetate shoreline areas with emergent aquatic species, shrubs, trees, grass, and sedges to provide food and cover for wildlife in consultation with BLM, USFWS, and CDOH *Avoid all Category 1 habitats through construction siting, where possible *Acres of Category 2 habitats/ranges may be destroyed by development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no net loss of in-kind wildlife/habitat value is realized. Although no commitment to required mitigation acreages is presented here, Operator recognizes that, based on

^a * Operator-committed mitigation.

Table C-1-5 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
ROAN CREEK AND BIG SALT WASH (GARVEY GULCH) RESERVOIRS
(continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	available information, some acres may need to be acquired and enhanced or enhanced to offset project impacts. New enhancement technologies in effect at the time of project development may change the amount of required mitigation acres. *Acres of Category 3 habitats/ranges may be destroyed through development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no loss of relative habitat value occurs. In-kind loss of habitats are to be minimized. No required mitigation acreages are presented; however, Operator recognizes that acquired and enhanced, or enhanced lands may be needed to offset project impacts and may differ from the amount of actual impacted acreage. *Revegetate all disturbed lands, where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife
	Wildlife mortality resulting from illegal harvest	Subsidize law enforcement programs *Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site *Promote wildlife protection education program as a part of employee orientation
	Displacement of wildlife resulting from increased human access to and activity in sensitive habitats	*No public access to critical wildlife habitats under CCSOP control without consultation with CDM and USFWS *Restrict ORV use on CCSOP controlled land

^a * Operator-committed mitigation.

Table C-1-5 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
ROAN CREEK AND BIG SALT WASH (GARVEY GULCH) RESERVOIRS
(concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	
		*Timing of construction and blasting to avoid breeding/nesting seasons
		*Equip machinery to suppress noise
		*Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time
	<u>Soils</u>	
	Loss of prime farmland	Compensation or siting
	<u>Vegetation</u>	
	Loss of threatened and endangered plant populations and habitat	*Compensation through restriction of access to other populations on CCSOP controlled property
		Avoid impact through siting alternatives
		Transplant specimens of threatened cacti to suitable protected habitats
	Potential impacts to wetlands at intake locations	*Preconstruction surveys of potential wetland areas
	<u>Land Use</u>	
	Loss of domestic livestock rangeland	Compensation or siting
	<u>Miscellaneous</u>	
	Erosion prevention at spillway toe	*Proper spillway design to prevent undercutting of the toe; use of riprap, gabions, or similar techniques
	Slope stability - reservoir dams	*Acceptable (proper) engineering design
	Dam failure	*Monitoring and an emergency dam failure program

^a * Operator-committed mitigation.

Table C-1-6 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
LA SAL, FRUITA, AND ROAN CREEK PIPELINES

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Surface and Ground Water</u>	
	Drainageway contamination	*Prevent spillage of oils, fuels or other hazardous materials from construction vehicles
	Protection of water quality and aquatic life	*Construction methods modified to minimize turbidity
		*Install pipeline valves on both sides of drainages or use best possible pipeline rupture technology
	Debris collecting in drainages from debris left in the watershed	Debris removed promptly from any floodplain surface
	<u>Wildlife</u>	
	Decrease in wildlife habitat quantity and quality	*Avoid removal of vegetation in riparian/wetland areas through use of siting alternatives *Revegetate all disturbed lands, where possible, except those adjacent to roadways, with vegetation mixtures favorable to wildlife Establish brush piles throughout reclaimed areas to increase availability of cover for small animals Avoid wetland areas through siting alternatives *Avoid all Category 1 habitats through construction siting, where possible *Acres of Category 2 habitats/ranges may be destroyed by development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no net loss of in-kind wildlife/habitat value is realized. Although no commitment to required mitigation acreages is

^a * Operator-committed mitigation.

Table C-1-6 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
LA SAL, FRUITA, AND ROAN CREEK PIPELINES (continued)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	presented here, Operator recognizes that, based on available information, some acres may need to be acquired and enhanced or enhanced to offset project impacts. New enhancement technologies in effect at the time of project development may change the amount of required mitigation acres.
		*Acres of Category 3 habitats/ranges may be destroyed through development of the CCSOP. The USFWS mitigation policy directs that mitigation of such impacts be accomplished such that no loss of relative habitat value occurs. In-kind loss of habitats are to be minimized. No required mitigation acreages are presented; however, Operator recognizes that acquired and enhanced, or enhanced lands may be needed to offset project impacts and may differ from the amount of actual impacted acreage.
	Wildlife mortality resulting from illegal harvest	Subsidize law enforcement programs
	Displacement of wildlife from increased human access to and activity in sensitive habitats	Implement a company firearm policy to curb employee possession of weapons while at work and while commuting to and from the project site. Promote wildlife protection education program as part of employee orientation. Equip machinery to suppress noise No public access to critical wildlife habitats under CCSOP control without consultation with CDOH and USFWS. Construction activities should be scheduled as much as feasible to avoid critical big game habitats during key periods of time. Timing of construction and blasting to avoid breeding/nesting seasons

^a * Operator-committed mitigation.

Table C-1-6 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
LA SAL, FRUITA, AND ROAN CREEK PIPELINES (concluded)

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION (cont.)	<u>Wildlife (cont.)</u>	
		*Avoid construction of project facilities on or near key wildlife use areas (nesting, fawning, calving areas)
		*Closures on CCSOP controlled property to ORV's as necessary
	<u>Soils</u>	
	Bank erosion during pipeline installation	Protect all areas of the bank where possible during construction; after construction, protect by replanting vegetation recommended by local land use managers of federal and state agencies
	<u>Vegetation</u>	
	Loss of threatened and endangered plant populations	Conduct searches of alternative alignments and route accordingly
	<u>Miscellaneous</u>	
	Dumping of excess backfill	*Excavated material not used as backfill will not be placed in the floodplain or wetland areas
	Spills	*Develop emergency cleanup program (under SPCC requirements)

^a * Operator-committed mitigation.

Table C-1-7 SUMMARY OF POTENTIAL IMPACTS AND RECOMMENDED MITIGATION
OFF-SITE

Project Phase	Major Impact/Concern	Mitigation Measures ^a
CONSTRUCTION AND OPERATION	<u>Wildlife</u>	
	Increase wildlife habitat quantity and quality to handle increased use	*Off-site habitat enhancement through application of fertilization and chemical enhancers in consultation with BLM, USFWS, and CDOW. Utilize nest boxes and platforms to provide nest sites in areas where nesting raptor densities are low and prey densities will support additional nesting raptors *Operator would contribute to consultation, organizing, and developing a regional wildlife management plan as appropriate in a cooperatively fund venture with USFWS and CDOW.
	Displacement of wildlife from increased human access to and activity in sensitive habitats	*No public access to critical wildlife habitats under CCSOP control without consultation with CDOW and USFWS. *Restrict ORV use on CCSOP controlled lands.
	<u>Cultural and Paleontological Resources</u> ^b	
	Unauthorized and unintentional collection or disturbance of cultural or paleontological resources	*Cultural resource and paleontological resource survey and required mitigation would be conducted prior to surface disturbing activities. If necessary, excavation, recordation, or avoidance would be performed.

^a * Operator-committed mitigation.

^b Such impacts and committed mitigation for cultural and paleontological resources would apply to the construction and operation phases of all project features in Tables C-1-1 through C-1-6, as well.

APPENDIX C-2
DETAILED SOCIAL AND ECONOMIC MITIGATION MEASURES

HOUSING

- The Operator proposes to build a construction camp accommodating up to 1,500 single-status workers. This camp will be located near the project in Garfield County under the Proposed Action, Clear Creek, and Fruita I alternatives and in Mesa County under the Fruita II Alternative.
- The Operator will make available to the local development industry information on employment levels, its construction schedule, and the type, quality and price of units that may be desired by its employees. Information on housing availability will also be made available to new residents through a referral center.
- The Operator will consider the following techniques to stimulate housing construction:
 - Providing guarantees to developers
 - Guaranteeing occupancy of a specific number of units for a certain number of years in mobile home parks, subdivisions, and apartments
 - Providing construction financing to developers
 - Depositing capital in local banks to improve the availability of financing
 - Providing land or improved lots to developers
- Keeping housing prices to an affordable level is often identified as an impact in rapidly developing areas. The Operator will consider the following techniques to ensure its employees can afford housing:
 - Setting price ceilings for units built by developers receiving financial support or guarantees from the Operator
 - Buying down interest rates if they are at a level which precludes employees from entering the market
 - Underwriting mortgages for a period of time for employees
- Affordable housing for seniors has already been identified as a concern in the study area. The Operator will work with local seniors groups and the Housing Authority to determine the number of mobile home pads or housing units it could set aside for seniors in housing developments receiving financial support from the Operator.

- Quality development and construction will be emphasized whenever the Operator provides financing or guarantees to builders. Similarly, through its technical assistance, the Operator will encourage local governments to establish design review standards and processes.
- The Operator will encourage, through its mitigation activities, growth to locate in areas where there is existing capacity in utility systems and community facilities or where expansion of facilities has been planned.
- The Operator will encourage local governments to tie land use decisions to utility service areas and planned extensions, in an effort to keep utility systems efficient.

GOVERNMENT FINANCE AND COMMUNITY INFRASTRUCTURE

- The Operator will encourage and assist local governments and service districts to put utilities affected by the Operator on an enterprise fund basis so that system costs are paid for by revenues generated from users, and growth will pay its way.
- Several services may benefit from being provided or coordinated at the county or regional level, either because of the nature of the service or because differences in the size of the tax base between entities may lead to unacceptable differences in the level of service. Such services may include transportation, planning, parks and recreation, fire and solid waste. At the time the Operator begins implementing its mitigation efforts, it will work with affected entities to identify and discuss the appropriate strategy for providing these services.
- In order to ensure any required utility expansion occurs in proper sequence with the Operator's growth, the operator will consider prepayment of residential plant investment fees.
- Before any commitment is made to contribute to new capital facilities, the Operator will work with the local government concerned to make sure that there is a long term, stable source of revenues to cover induced operating and maintenance costs associated with the new facility.
- Fiscal analysis shows that the Operator increment of growth creates a cumulative surplus in both counties that is more than sufficient to cover all of the incremental public costs attributable to the project, and the projected incremental shortfalls in the municipalities. Thus, revenue sharing between the counties and municipalities would appear to be one key to overcoming potential fiscal problems. The Operator will work cooperatively with Garfield and Mesa counties to discuss the feasibility of this approach.
- State law allows the use of severance tax credits, in a prepayment formula, to mitigate the impacts of growth. This severance tax credit arrangement uses the Operator's funds that would otherwise go to the State Department of Local Affairs discretionary impact

formula, to mitigate the impacts of growth. This severance tax credit arrangement uses the Operator's funds that would otherwise go to the State Department of Local Affairs discretionary impact assistance fund. The Operator proposes to use the severance tax credit mechanism to provide financing to those municipalities and other units of government that face revenue shortfalls related to the Clear Creek Shale Oil Project. This will require a formal agreement between the Operator, local government, and the state.

- The Operator may also consider the following options for financial assistance:
 - Additional technical assistance to pursue matching state or federal funds
 - Prepayment of property taxes
 - Bond programs in which the Operator makes debt service payments for the first few years until the tax base catches up
 - Bond or loan guarantees
 - Lease back arrangements where the Operator builds facilities and leases them back to local government as the tax base catches up

HUMAN SERVICES

- The need for specific human service programs is often difficult to assess ahead of time. Thus, the Operator's approach will be to work with existing human service coordinating organizations to determine the extent of the Operator's impact and the most effective methods of alleviating any difficulties. Such techniques may include:
 - Technical assistance
 - Financial assistance for additional staff persons or new programs
 - Developing an employee and family orientation program to help new residents adjust to the community
- The Operator proposes to include recreation facilities as part of the construction camp complex.

MINE CLOSURE

Depending on which production alternative is selected by the Operator, closure of the mine could take place anywhere from 30 to 100 years hence. As it is difficult to predict conditions that will exist at that time, the Operator will make information available to local communities about the mine closure in a manner to allow adequate lead time to develop strategies to

minimize any adverse impacts. These strategies will be developed in conjunction with affected communities and may include a phased shutdown, reduction of the workforce through attrition rather than layoffs, and supporting local efforts to secure replacement jobs in the area. As discussed in this section, the Operator will work with local government at the early stages of the project to provide appropriate guarantees for bond issues and public debt which could be affected by an unanticipated shutdown of the project.

EARLY PROJECT CLOSURE OR DELAY

The overall socioeconomic analysis, and particularly the mitigation strategy described herein, emphasizes Operator supports and guarantees for local government at the early stages of the project. This will minimize nonguaranteed public debt during this period. Therefore, if the project should be delayed or closed during its early stages, public agencies will not have extensive project related debt. In addition, the Operator will continue its practice of open communication and cooperation to keep agencies as well informed as possible of project plans.

MITIGATION MEASURES SPECIFIC TO GARFIELD COUNTY

Land Use & Development

- The Operator will work to ensure that any development that it guarantees or supports is consistent with the goals and policies of the county and municipalities within it. The County will be encouraged to support municipal efforts to manage growth. In particular, the Operator encourages the County to tie its land use decisions to utility service areas and planned utility extensions and adhere to its Comprehensive Land Use Plan goals of requiring new development to locate in or near existing urban centers.

County and Municipal Cooperation

- As stated previously, the County is expected to have more than sufficient revenues to cover its costs of growth. Municipalities, however, are more limited in the size and number of revenue sources available to them. The County is encouraged to analyze a use tax and potential distribution formulas. Analyzing sales tax distribution schemes to cope with the lead time problem is also suggested. However, the Operator recognizes that the County must

- There are some services which might be more efficiently provided all or in part by the county rather than by municipalities. This would avoid overlap or gaps in service and also take advantage of the larger county tax base. Such services include parks and recreation, fire protection and solid waste. By lifting these from the municipal level, municipalities would be able to use their limited financial resources for services of a more urban nature that are best provided by a municipality.
- The Operator will work with emergency services in both counties to develop a coordinated approach to address major emergencies or accidents at or in the vicinity of the project facilities.

Housing and Community Services

- The Operator feels that an urban level of services is necessary in Battlement Mesa. The Operator is prepared to work with the county to ensure this is provided and if necessary will make funding for facilities or staff available to the county.

Other Actions

- Other issues may arise over the effect of growth on countywide services such as museum, library, and medical services. The Operator is prepared to work with the county to find solutions to difficulties attributable to the Operator's activities.

MITIGATION MEASURES SPECIFIC TO THE RIFLE AREA

The Rifle area has not been identified as an area where the Operator will encourage project direct employees and population to locate. Any new growth occurring in Rifle that results from the Operator's activity in the general vicinity will be stimulated by people or businesses who have made an independent decision to locate in Rifle rather than areas where the Operator is providing assistance. However, the Operator will work cooperatively with Rifle to monitor growth and to resolve the Operator-related growth problems, if they should occur.

Several growth management actions could be taken by local government entities in Rifle to prepare the communities further for any growth which may occur.

Utilities

- The City of Rifle is encouraged to carefully analyze plant investment fees and monthly service charges for the water and sewer systems so that both utilities are operating on a self-sufficient "paying its own way" basis.

Capital Facilities

- Before financial commitments are made to capital facilities, supporting revenue sources should be identified that are stable and sufficient to cover the induced operating and maintenance costs.
- Capital facilities of a regional nature (such as a recreation center) that may be proposed for Rifle may benefit from administration by the county or a district controlled by the county. In this way, oil shale project facilities can be included as part of the tax base.

MITIGATION MEASURES SPECIFIC TO THE BATTLEMENT MESA AREA

Location of a large proportion of the population arising from the Operator's operations in the Battlement Mesa Planned Unit Development is a key element in the spatial allocation analysis. As stated previously, this strategy can take advantage of existing and planned capacity (in community facilities and services, housing, etc.) and thus reduce the effects of rapid population growth on communities less prepared to absorb it. Battlement Mesa maintains adequate capacity to absorb CCSOP growth as well as growth that might eventually occur if the Colony Project were revived. The Operator thus anticipates directing many of its mitigation efforts to this area. Listed below are several of the key options which the Operator may take to ensure there are sufficient housing and community facilities to meet the demands of its population.

Housing

- Discussions will be held with Battlement Mesa, Inc. to ensure adequate land for housing is reserved for the first years of employment.
- Guarantees and/or construction loans may be made to home builders to stimulate housing construction during the first phases of the Operator's activity in the area. It is anticipated that after such time, private developers will be willing to assume risks without the Operator's support.

- Developers selected to build housing to accommodate the Operator's employees will have to meet standards set by the Operator as to the quality of design, type, and quantity of units.
- Similarly, ceiling prices for units may be set so that the units are affordable. Other actions such as subsidizing interest rates and/or rental rates will also be considered.

Community Infrastructure and Services

- Prepayment of plant investment fees will be considered if necessary to reserve sufficient capacity in the utility systems.
- The available capacity of the utility systems will be evaluated for thresholds which may be exceeded due to the Operator's incremental growth. If it appears this may occur, negotiations will be made with the appropriate agency(ies) to ensure that any necessary expansion will occur in a timely manner.

Governmental Relations

- The Operator will work with the county to ensure an adequate level of county services (such as sheriff's protection) is committed to the area and revenues are available for the operation of community services and facilities.
- A strategy will be developed which deals with the financial, institutional and timing issues surrounding Battlement Mesa's relationship with Parachute and the county. Such options include remaining an unincorporated subdivision, annexation or separate incorporation.

MITIGATION MEASURES SPECIFIC TO THE PARACHUTE AREA

As with Rifle, it is anticipated that population growth from the Operator's activities will not be encouraged to locate in Parachute. However, the Operator will be sensitive to issues which may arise such as additional traffic on streets in Parachute and additional police calls, and is willing to work with the community to resolve problems attributable to the Operator-related population.

MITIGATION MEASURES SPECIFIC TO MESA COUNTY AREA

Under all alternatives, it is anticipated that Mesa County will receive the greater proportion of population growth resulting from the Clear Creek Shale Oil Project. The Operator anticipates focusing mitigation efforts on the

Grand Valley area (roughly the area from Palisade to Fruita). This sub-section outlines several actions which the Operator may pursue at the county level to help manage growth occurring in the area. These may include the following:

Land Use and Development

- The Operator may provide assistance to the county to develop a land use plan and regulations to avoid the potential for development to become scattered through the De Beque valley (causing difficulties in providing government services, among other things). The Operator has already assisted De Beque with its Master Plan.
- In all areas of the County, the Operator will encourage the County to tie its land use decisions to utility service areas and planned utility extensions. This will help minimize the cost of providing water and sewer service in the county.
- In general, the Operator will encourage the county to support the land use plans and goals of the individual municipalities within it. In particular, the Operator will ensure that any development receiving financial support or guarantees from the Operator will comply with county or municipal (as appropriate) growth management goals.
- The Operator is sensitive to local efforts to protect agricultural and orchard land from urban development and will consider this in working with housing developers.

County and Municipal Cooperation

- Fiscal analyses undertaken as part of this study indicate that the county will benefit financially more than the individual municipalities. To help overcome potential difficulties at the municipal level, the Operator will encourage the County to analyze the feasibility of redistributing a greater proportion of the countywide sales tax revenues back to the municipalities. Another solution which may be explored in addition, is transferring some services that are more regional in nature such as parks and recreation from the municipal to the county level. These local government decisions will require careful analysis.
- Fire protection is another service that may benefit from coordination at the county level for two reasons. First, it would avoid overlap or gaps in service. Second, because of the location of project facilities there will be an uneven distribution of tax base which could create an uneven level of service throughout the county. Service levels could be streamlined by some county support.

- The Operator will work with emergency service agencies in Mesa and Garfield counties to develop a coordinated plan to deal with major industrial or other accidents in the vicinity of project facilities.

Housing

- Cooperation with the local housing authority and senior's associations will determine whether housing units and mobile home spaces should be reserved for seniors in subdivisions or developments receiving financial assistance from the Operator.

Human Services

- Support for human services in the area will be funneled through the existing human services council.

Other Actions

- The Operator is aware that issues may arise over the effect of growth on other county services such as the Vocational-Technical College, library and county museum. The Operator is willing to work with the County to find solutions to difficulties attributable to the Operator's activities.
- The Operator will provide information concerning the skill levels necessary for CCSOP employment, and will encourage the development of local training programs. The Operator will also adopt a policy of hiring qualified Mesa and Garfield County locals whenever possible.

MITIGATION MEASURES SPECIFIC TO THE GRAND VALLEY AREA

The Operator anticipates that a large proportion of its workforce and associated population will locate in the Grand Valley. The housing industry in this area has indicated it has the capacity to build a substantial number of housing units annually. Thus, while the Operator will provide information and incentives to stimulate the market, it may play a much less visible role than in Battlement Mesa. Capacities of the primary utility systems in the valley have been planned to accommodate growth also. Most of the specific actions which the Operator may take to alleviate or avoid difficulties have been outlined in the previous section; the following are amplifications:

Housing

- The Operator will work with the local development industry to assure sufficient housing is available when needed. Actions may include:
 - Guaranteed occupancy in mobile home parks, apartments and/or subdivisions for a certain number of years
 - Guarantees and/or financing for builders
 - Depositing funds in local banks to supplement capital available in local communities
 - Setting standards for location of units, design and mix of type, and price ranges for builders taking advantage of the Operator incentives
 - Providing land or developed lots
- If either of the Fruita Alternatives are pursued by the Operator, these incentives may be focused on the Fruita area to ensure the housing industry can respond adequately.
- The Operator will provide as much information as possible regarding employment levels and timing so that the local development industry can be more responsive to the operator's needs.
- The Operator's efforts to stimulate housing for the elderly will be concentrated in the Grand Valley as this is where the problems potentially could be most serious.

Utilities

- It may be necessary to prepay plant investment fees to guarantee sufficient and timely expansion of water and sewer systems if either Fruita alternative is pursued.

MITIGATION MEASURES SPECIFIC TO THE DE BEQUE AREA

Because the basic community infrastructure to accomodate a large increase in population is not in place or planned for De Beque, the Operator does not anticipate that significant population growth associated with its activities will locate in the area. However, the location of the project north in the Roan Creek Valley will have an effect on the Town. The Operator will work cooperatively with DeBeque to determine project-related growth impacts. Specific actions to alleviate or avoid negative effects may include:

- The Operator may offer technical assistance to the Town to assist it to achieve its land use goals in the De Beque Valley. Town and County cooperation will be necessary to avoid scattered development in the valley.
- The Operator may also offer technical assistance to the town to help establish zoning and development regulations so that compatible uses develop around the Operator's rail facilities. The Operator will work with the Town to resolve any issues surrounding the provision of services to the rail facilities or annexation to the town.
- The Operator will work with the community to develop a highway bypass around the community.



Chevron Shale Oil Company •

Great West Plaza, Tower 2, 1625 Broadway, Suite 2150, Denver, CO 80202 • Phone (303) 623-8282

D. Roger Loper
President

August 25, 1982

Mr. Charles Pence, President
Battlement Mesa, Inc.
Parachute, Colorado

Dear Mr. Pence:

Thank you for taking the time to meet with Doug Moore, Rebecca Mack, and Mike Rock on August 12. I appreciate the information and the tour you provided to our people.

It is my understanding that Battlement Mesa's infrastructure is largely in place, and that you have existing capacities to serve in excess of 25,000 people. It is my further understanding that Battlement Mesa is open to, and in fact encourages, use by the general public and employees of other shale oil companies.

For the purposes of the Clear Creek Environmental Impact Statement, it is necessary for Chevron to identify where our employees might choose to live. In view of the availability and proximity of Battlement Mesa to our Project, we propose to identify Battlement Mesa as a potential housing location for as many as 3000 employees. This should not require any expansion of existing Battlement Mesa infrastructure.

We recognize that conditions may change between now and when the Clear Creek Project construction begins. We will certainly keep you informed of our plans as they develop.

Thank you again for your cooperation.

Sincerely,

A handwritten signature in dark ink, appearing to read "D. Roger Loper".

A-23

cc: M. J. Rock



**BATTLEMENT
MESA
INC.**

P.O. Box 278
Parachute, Colorado 81635
(303) 285-8131

MR

September 9, 1982

Mr. Roger Loper
President
Chevron Shale Oil Company
Great West Plaza, Tower 2
1625 Broadway, Suite 2150
Denver, Colorado 80202

Dear Mr. Loper:

I believe it may be helpful to clarify the fact situation as it relates to the second paragraph of your letter of August 25, 1982.

Status of infrastructure in place at Battlement Mesa is as follows:

- . Major roadways are in place.
- . Wastewater treatment capacity will accommodate approximately 15,000 population. The facility is laid out to enable on-site expansion up to 54,000 population should the need arise.
- . Major power feeds are constructed.
- . Water treatment plant will supply up to 20,000 population.
- . Without any additional capital expenditure on infrastructure Battlement Mesa could add 1500 garden apartments and 600 single family homes.

You are correct in that Battlement Mesa does have available homes for sale, apartments for rent and spaces in both the mobile home park and RV park. They are freely available in the open market to any who qualify for rental or purchase. Currently, we are experiencing a net growth of 5 to 7 units per week.



Chevron Shale Oil Company

Great West Plaza, Tower 2, 1625 Broadway, Suite 2150, Denver, CO 80202 • Phone (303) 623-8282

October 4, 1982

Mr. Steve Moore
Bureau of Land Management
764 Horizon Drive
Grand Junction, CO

Dear Mr. Moore:

Enclosed, for your information, is a recent exchange of correspondence between Chevron Shale Oil Company and Battlement Mesa, Inc., concerning the potential availability of Battlement Mesa to meet some of Chevron's housing needs.

Please contact me if you have any questions.

Sincerely,

MJR
Michael J. Rock

MJR:gp

Enclosure

cc: G. K. Fisher
Adam Poe
Lee Merkel
Dennis Strange
Ray Gromwall
Bruce Purdy
BMML

Mr. Roger Loper

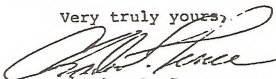
-2-

September 9, 1982

Assuming housing units are available at the time Chevron's needs arise we will be happy to supply the housing.

Best wishes to you and your Clear Creek Project.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Charles L. Pence", written in a cursive style.

Charles L. Pence
President

CLP/brs

R'S CARD

5 1983b

impact

OFFICE		DATE RETURNED
Division		12/2/89

(Continued on reverse)

